JULY, 1954

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

1934 · 1954 20th ANNIVERSARY YEAR

Free-Machining Tool Steel

•

Cast Aluminum Tool & Jig Plate

•

Pressworking the Aluminum Alloys

•

Air Power for Metalworking

•

Air Serves Broad Industrial Field

•

Engineering the Compressor Installation

•

Automated Presses

•

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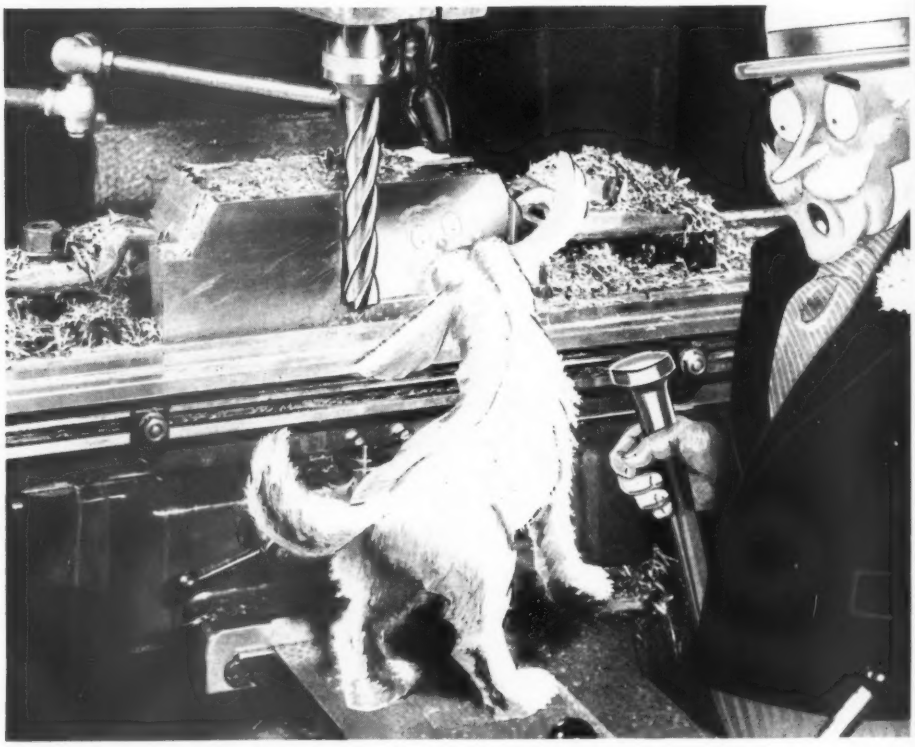
CLEVELAND 18, OHIO

BPA



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Noted For Fast Free Cutting on toughest metals at heavy feeds and high speeds, Putnam End Mills produce smooth accurate cuts having exceptional finishes that often eliminate all grinding or hand finishing.

Your toughest milling operation is an opportunity to prove the unusual superiority of Putnam End Mill design and manufacture. Select from over 1200 sizes and types of standard Putnam End Mills the one for your job and then watch it more than meet the challenge with faster, smoother cutting.

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RADIUS FORMING TOOLS

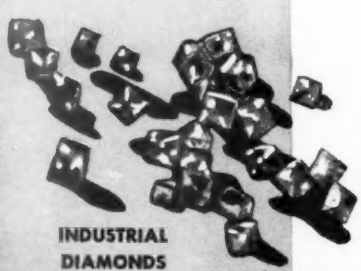
"TRU-LINE" PROFILE DRESSING TOOLS

IMPREGNATED DRESSING TOOLS

STANDARD DRESSING TOOLS

"TRU-THREAD" THREAD DRESSING TOOLS

DIAMOND GRIT TOOLS FOR THREAD DRESSING



INDUSTRIAL DIAMONDS

NEW DIAMOND GRIT FORM-BLOCKS

drastically cut wheel-forming costs

The Diamond Grit Form-Block is the result of a program launched by our engineers three years ago with the objective of reducing time and cost factors in rough forming opposed abrasive wheels used simultaneously in grinding turbine jet "buckets".

The rough forming operation, using a single point diamond tool had been taking ten to fifteen hours and, because it was performed on the grinding machine, downtime was very costly.

The Diamond Grit Form-Block cut downtime from hours to minutes and produced time and production gains which paid for the Form-Block in the first few sets of wheels formed. Final finish wheel dressings are done quickly and lightly with a small specially-shaped diamond.

The Diamond Form-Block has exceptionally long life. One Form-Block has formed 30 pairs of 20" wheels without showing appreciable wear.

WHEEL TRUEING TOOL COMPANY

51-3200 West Davison Ave. • Detroit 38, Mich.

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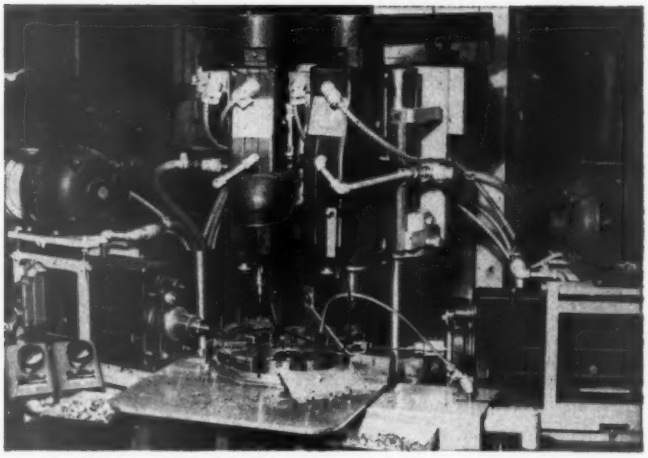
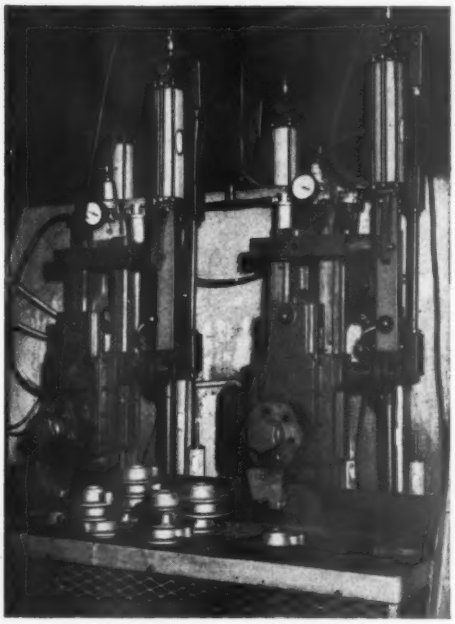
WITH THIS UNIQUE AIR MOTOR

you can build cost-cutting special machines or modernize existing machines right in your own shop with your own personnel

This semi-automatic set-up at Eastman Manufacturing Co. doubled production and eliminated fatigue in milling bakelite magneto parts.



This drilling machine, built by Horrocks-Ibbotson, turned out 1 year's production of their fishing reel pawl blocks in 3 months.



A simple installation cut lathe time on steel ordnance parts from 90 to 10 seconds per piece at Joseph Pickard's Sons of Philadelphia.

Even for short runs you'll find special machines built around this versatile power unit will pay off in a big way — in greatly lowered costs, in fewer rejects, in better product quality. No expensive engineering is needed. In fact, your local Bellows Field Engineer may have in his Foto-Facts File basic designs that can be readily adapted to your product and your production processes.

Your own tool room can build such special machines at decidedly low cost, and quickly. Often they pay for themselves with the first week's savings.

Bulletin CL-50 tells the story of the Bellows Air Motor and the part it is playing in cutting manufacturing costs in hundreds of plants. Address: The Bellows Co., Dept. TP-754, Akron 9, Ohio.

The Bellows Co.

IN CANADA: Bellows Pneumatic Devices of Canada, Ltd.
4972 Dundas St., W., Toronto, Ontario

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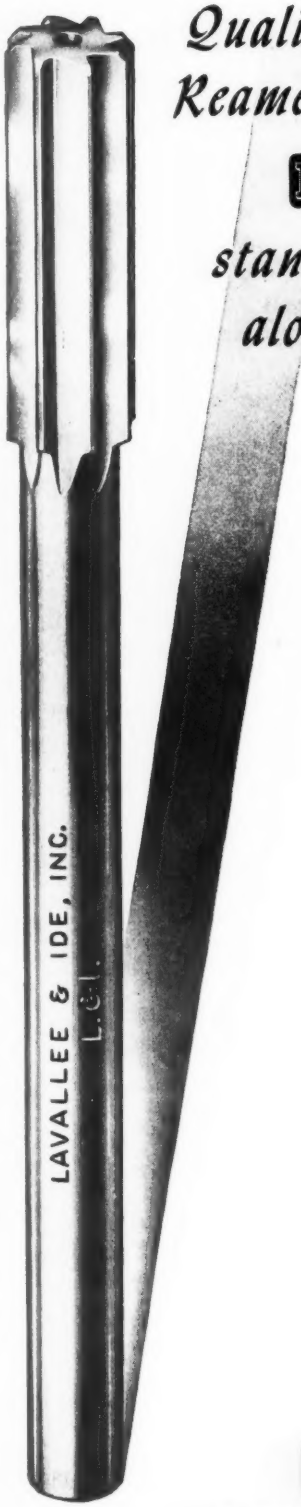

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L&I

stands alone

L&I

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CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly
Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-51

VOL. XX—No. 4 JULY, 1954

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TOOLING and PRODUCTION'S great appeal is to those men who operate the plants and divisions of industry, their production departments and their toolrooms. It is they who collectively are charged with the responsibility of manufacturing their companies' products precisely, efficiently and profitably.

They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

Every copy is directed to these men by name, by title and by company address. Please see our CCA verification.

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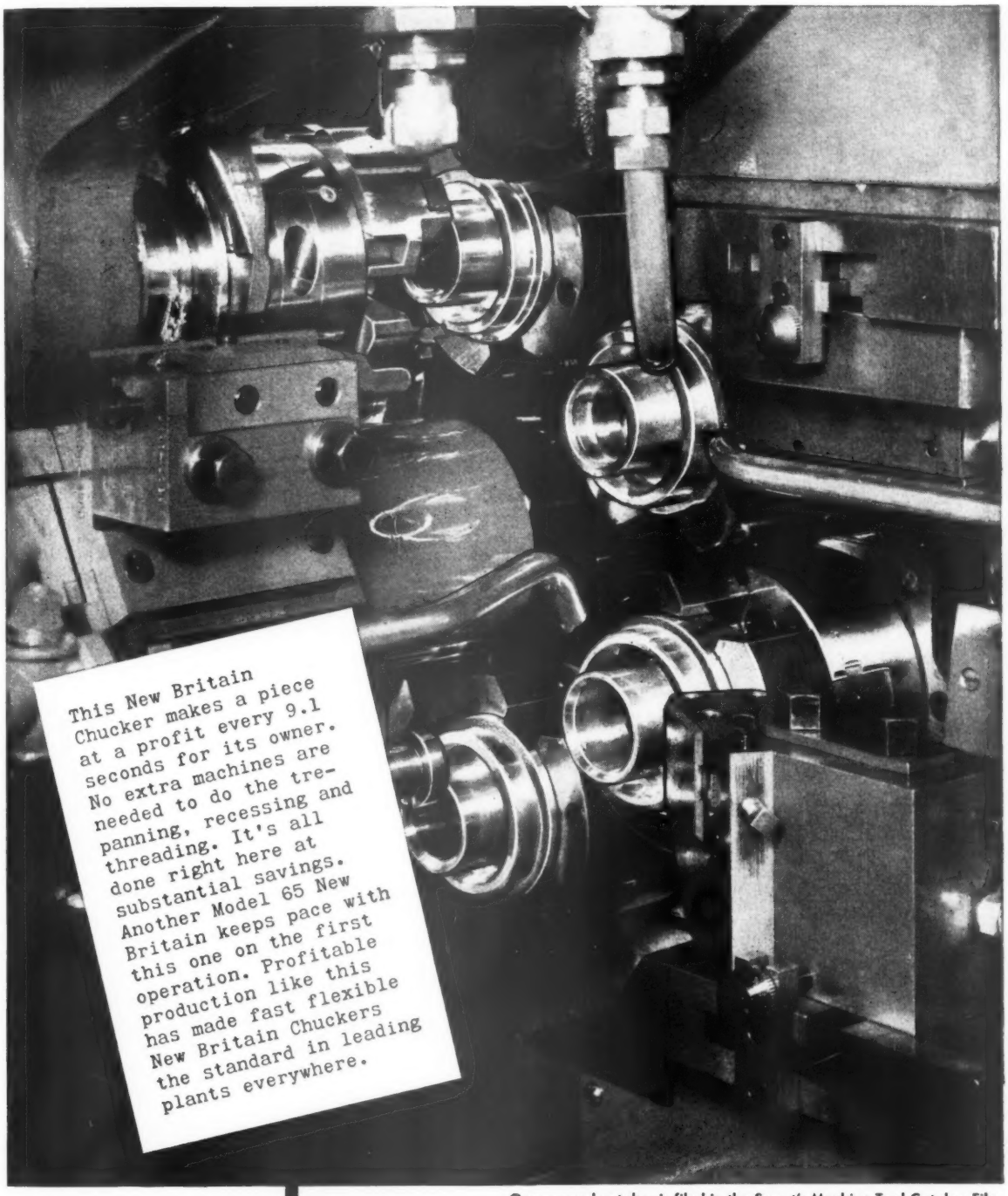
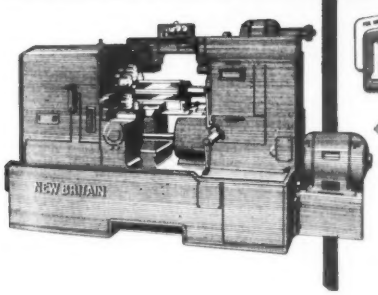
Tooling and Production ★ Die Designing and Estimating ★ Plastics Molds
The Know-How-Library of Tooling and Production


This New Britain Chucker makes a piece at a profit every 9.1 seconds for its owner. No extra machines are needed to do the trepanning, recessing and threading. It's all done right here at substantial savings. Another Model 65 New Britain keeps pace with this one on the first operation. Profitable production like this has made fast flexible New Britain Chuckers the standard in leading plants everywhere.

Our general catalog is filed in the Sweet's Machine Tool Catalog File.



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. . . Machines for Making Progress

Automatic Bar and Chucking Machines
Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
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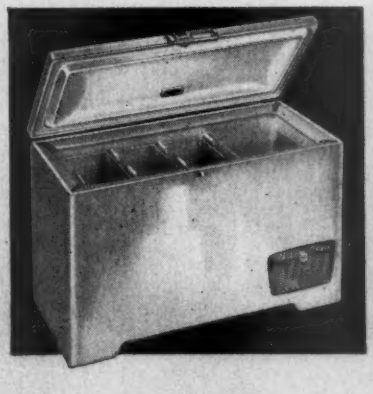
CIRCLE INFORM-A-GRAM KEY NO. 5

toolmakers prefer this

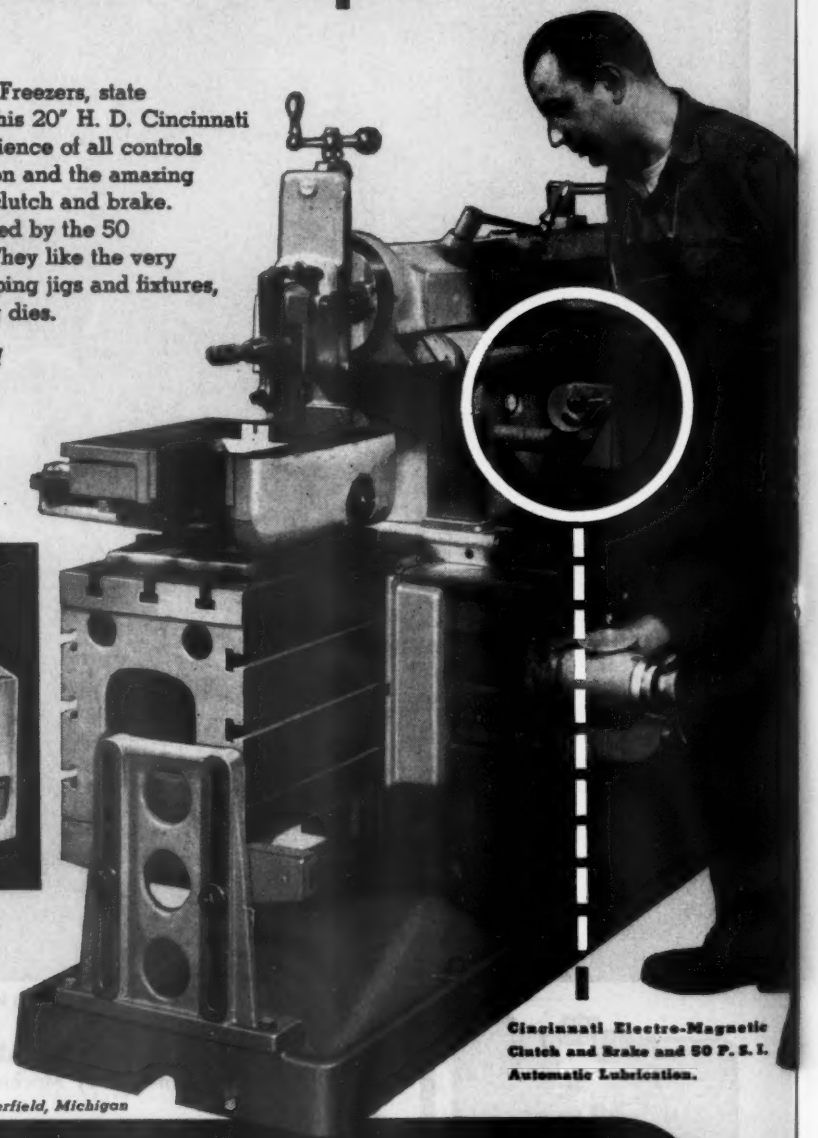
CINCINNATI shaper

Revco, Inc., producers of Food Freezers, state their toolmakers prefer using this 20" H. D. Cincinnati Shaper. They like the convenience of all controls located at the operator's position and the amazing speed of the electro-magnetic clutch and brake. They like the assurance provided by the 50 P.S.I. automatic lubrication. They like the very high accuracy obtained in shaping jigs and fixtures, drawing, forming and blanking dies.

Write for the new illustrated catalog N-6 on Cincinnati Shapers.



17 cubic foot Revco, one of many Food Freezer models built by Revco, Inc., Deerfield, Michigan



Cincinnati Electro-Magnetic Clutch and Brake and 50 P. S. I. Automatic Lubrication.

Photo courtesy Revco, Inc., Deerfield, Michigan

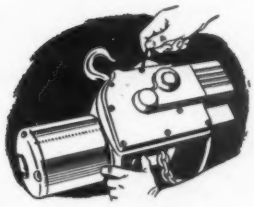
CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

23 UNBRAKO Socket Head Cap Screws are used to assemble this lightweight, high efficiency electric hoist. They were selected for their uniform accuracy and high tensile strength.

The knurling on the head of UNBRAKO Socket Head Cap Screws permits faster assembly, because of the positive slip-proof grip.



The uniform depth and size of the hex socket assure strength and maximum torque in wrenching—extremely important in the cap screws used to fasten assemblies like this.

UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; controlled fillet and continuous grain flow for strength. In standard sizes from # 4 to 1".

Save time and money by using UNBRAKO Standards...stocked by your distributor

You'll have less money tied up in inventory, you'll need less space for storage, you'll get personalized service and faster deliveries. And you'll be buying the finest socket screw products that modern machines, complete facilities and quality control can produce. Write for UNBRAKO Standards, a complete listing of socket screw products made by the world's largest producer. STANDARD PRESSED STEEL Co., Jenkintown 36, Pa.

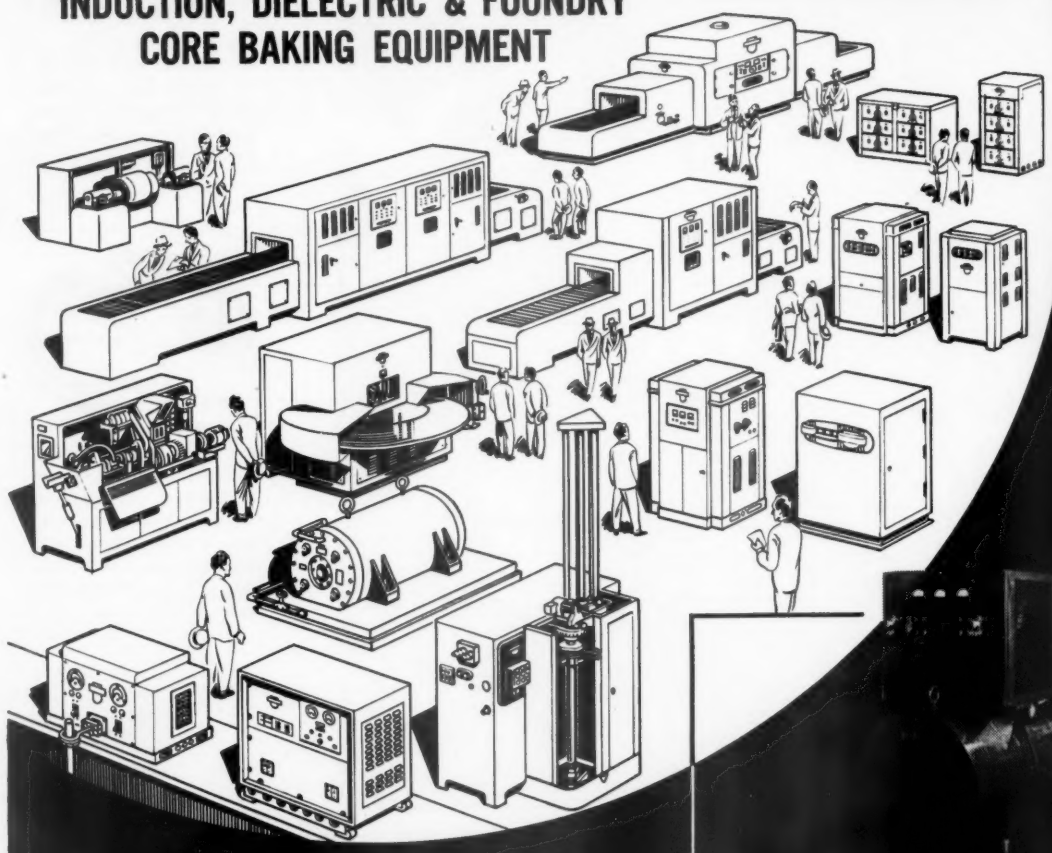
UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 7

THER-MONIC

RENTAL PLANS
also available!
Write for details!

. . . the most complete line of INDUCTION, DIELECTRIC & FOUNDRY CORE BAKING EQUIPMENT



High Frequency Heating by cutting production costs, enables you to pace today's competition! Use it to braze, solder, harden, anneal, forge or melt . . . to bake foundry cores . . . to preheat or cure plastics . . . to process foods, chemicals, textiles, wood, paper, etc.

THER-MONIC produces (note above) the country's widest range of *standard* heat treating equipment in various powers and frequencies.

They are versatile and efficient. You can bank on them to achieve uniform results—with unskilled labor . . . and not in minutes or hours—but in *precious* seconds!

We welcome the opportunity to recommend appropriate tooling and equipment guaranteed to produce the desired quality and production rates. Inquiries invited!

INDUCTION HEATING CORPORATION
181 WYTHE AVENUE, BROOKLYN 11, N. Y.
The most complete line of High Frequency Equipment

THER-MONIC
MOTOR GENERATORS
are available with
capacities up to 250 KW

INDUCTION HEATING CORP. **Dept. TP**
181 Wythe Ave., Brooklyn 11, N. Y.

Gentlemen:

I would like more information about THER-MONIC Equipment for...

☐ Brazing ☐ Soldering ☐ Hardening ☐ Forging
☐ Annealing ☐ Melting ☐ Foundry Core Baking
☐ Dielectric Heating ☐ Rental Plans
☐ Have your representative call!

Name.....
Company.....
Title.....
Street.....**City**.....
State.....

CIRCLE INFORM-A-GRAM KEY NO. 8

a hole here makes waste...

a hole here makes a saving

Crucible Hollow Tool Steel Bars **are a boon to the metalworking industry. The hole in these quality bars enable toolmakers to eliminate drilling, boring, cutting-off and rough-facing operations. This cuts production time, boosts machine capacity and saves scrap losses.**

They are available now, in any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades — KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high carbon-high chromium, AIRKOOL air-hardening, and NU DIE V hot-work tool steels — from a conveniently located Crucible branch warehouse.

Let your Crucible representative show you how these steels can best help *you*.

CRUCIBLE first name in special purpose steels

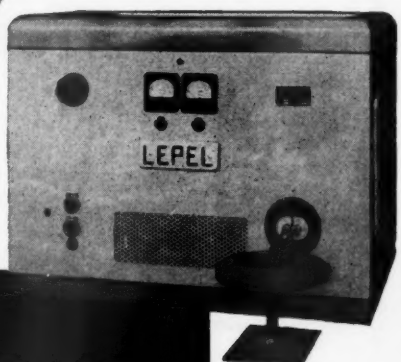
54 years of Fine steelmaking **HOLLOW TOOL STEEL**

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

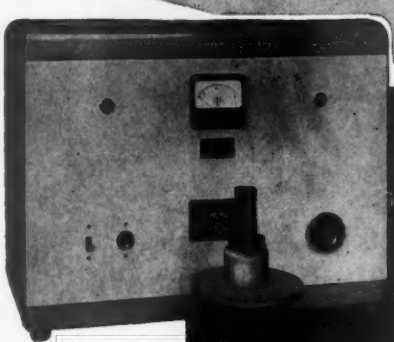
CIRCLE INFORM-A-GRAM KEY NO. 9

Lepel's 3 new

LOW COST - PORTABLE HIGH FREQUENCY *Induction* HEATING UNITS



MODEL T-2½-1 Electronic Tube Operated
$1620.
f.o.b. factory



MODEL 2 KW Spark Gap Operated
$870.
f.o.b. factory

Ideal for

- Production Heating of small parts
- Research Laboratories
- Tool Rooms
- Machine Shops
- Educational Institutions

MODEL T-1 Electronic Tube Operated
$885.
f.o.b. factory

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of pioneering electrical and metallurgical experience, the name Lepel has become the symbol of induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

Amazing in its speed, Lepel equipment reduces the time required for hardening, annealing, stress relieving, brazing, soldering and melting from minutes to seconds. It performs these operations with a degree of precision and uniformity rarely attained through other processes.

LEPEL Electronic Tube GENERATORS available from 1 kw to 100 kw.
LEPEL Spark Gap CONVERTERS available from 2 kw to 30 kw.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information on high frequency induction heating.

BRAZING Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

HARDENING Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

SOLDERING Speedily and neatly performs intricate soldering applications with or without the use of preformed rings.

ANNEALING Ideal for annealing, stress-relieving, normalizing or pre-heating selected areas.

MELTING Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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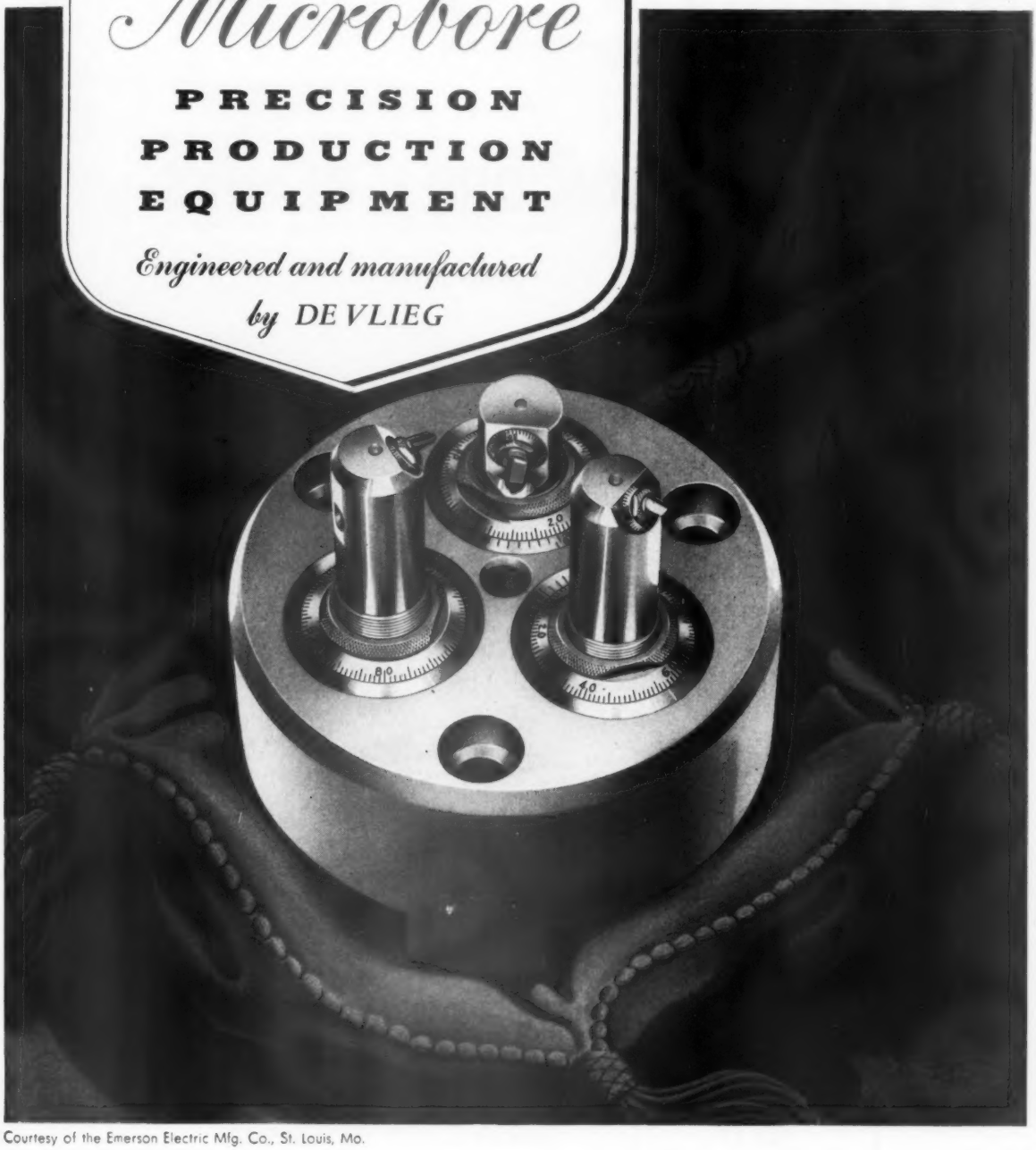
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 10

Microbore

PRECISION PRODUCTION EQUIPMENT

Engineered and manufactured by DEVLIEG



Courtesy of the Emerson Electric Mfg. Co., St. Louis, Mo.

Illustration shows Microbore cluster tool furnished to Emerson Electric Co., for finish turning O.D.—finish boring I.D. and facing operations at one pass. Standard Microbore units are arranged to provide micrometer vernier adjustment for both radial and linear settings of the cutting tools.

Send for new illustrated catalog.

Discuss your tooling problems with our Microbore specialists

DEVLIEG MICROBORE COMPANY 480 Fair Avenue, Ferndale • Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 11

ORANGE 3-4301

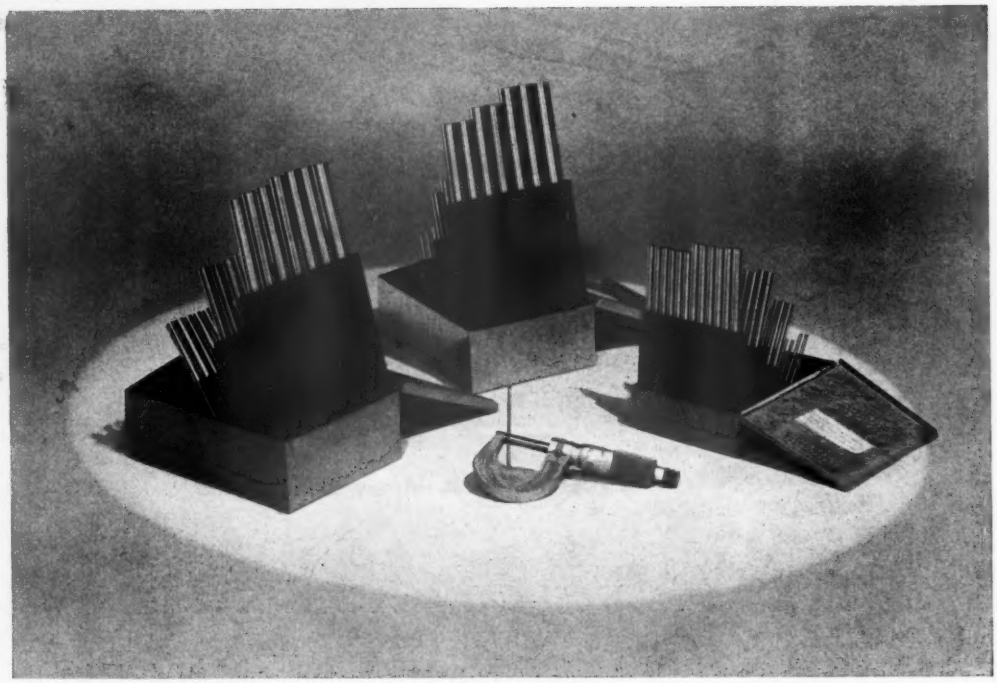
ESTABLISHED 1927

WILLIAM T. HUTCHINSON CO.

235 MAIN STREET

ORANGE, NEW JERSEY

HUTCHINSON DRILL BLANKS



115 Pieces – COMPLETE – .040" to .500" – $77.33

JOBBER SET	LETTER SET	WIRE SET
$27.12	$24.54	$25.67
in Huot Index	in Huot Index	in Huot Index

HIGH SPEED STEEL—64 "C" scale hard— gage tolerance—mirror finish.

A NOTE TO REMEMBER

We have large stocks of semi-finished material ready to be ground to meet your requirements.

CIRCLE INFORM-A-GRAM KEY NO. 12

Looking for versatility?

Illustration shows closeups of machine milling 36-gauge rack in textile machine needle beds with a gang of 58 cutters.

This production machine mills racks of varying pitches, widths and lengths

Here is another example of how the Special Machinery Division of Kearney & Trecker helps solve specific production problems. This rack milling machine was designed and produced for a textile machinery manufacturer who required a highly versatile machine that could mill racks up to 14' long with widely varying characteristics. The table has a working surface of 18" x 19', and the entire traveling head and knee assembly is rigidly supported on three hardened and ground steel ways.

Positioning can be accomplished manually or by power. A shot bolt, which engages in bored holes along one side of the indexing fixture, assures final positive positioning.

If you'd like to know how Kearney & Trecker special machinery can give you the exact tool you require, contact your representative or write for the booklet "Doorway to a proven method for solving big or small metal-working problems." For details on this particular machine, ask for Data Sheet No. 1011. Kearney & Trecker Corp., 6784 West National Avenue, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER CORP. · *Special Machinery Division*
MILWAUKEE 14, WIS., U. S. A.

CIRCLE INFORM-A-GRAM KEY NO. 13

Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc., 726 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

ACHIEVING PERMANENCE OF ACCURACY

Just as important as the initial accuracy of a precision machine tool is the *life expectancy* of this accuracy. And the most effective way to insure long-lasting accuracy is to give *dimensional stability* and *wear resistance* special consideration during machine design.

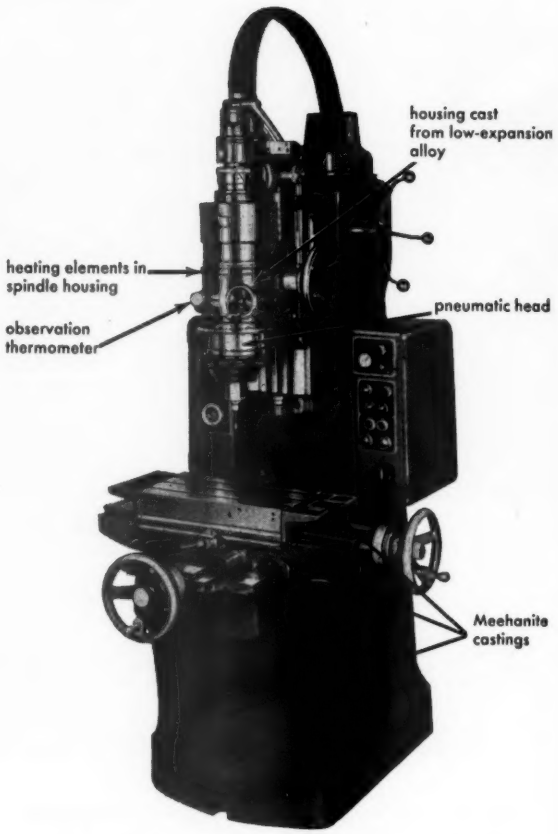
The following causes of dimensional *in*stability are most frequently encountered: thermal expansion, unstable constituents in the material; and stresses in the material. In the design of the No. 2 Moore Jig Grinder, all of these factors were taken into account and special features were incorporated to counteract them.

All the inherent accuracy of a measuring system, capable of positioning the workpiece in relation to the spindle within a tenth, is rendered nearly valueless if the spindle does not retain its position during machining operations. Such movement, caused by thermal expansion, is inevitable unless steps are taken during design to minimize or prevent it.

Electric heating elements were incorporated in the main spindle housing of the Moore Jig Grinder to maintain uniform temperature—whether machine is running or not. An observation thermometer is located so as to indicate any abnormal temperature change within the housing. The housing itself is cast from 36% nickel iron to further minimize effects of temperature variations. And a pneumatic head directs air onto the workpiece, preventing undue temperature rise both in the workpiece and in the locating members of the machine.

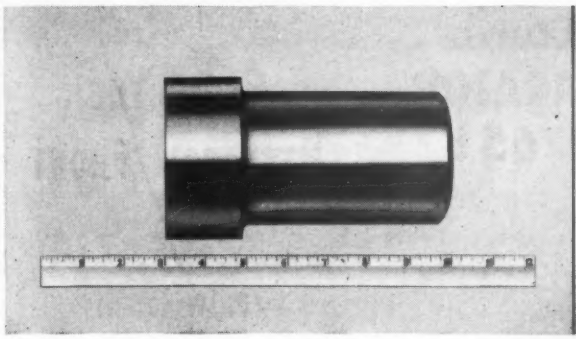
Instability resulting from gradual relaxation of locked-in stresses in castings is prevented by suitable stress-relieving cycles during the manufacture of Moore machine components. Similarly, the best way to avoid unstable hardened steel parts is by tempering them. Moore follows this practice.

Further wear resistance was built into the Moore Jig Grinder by means of: adequate way and bearing surface, scientifically proportioned to minimize and distribute wear; all reciprocating parts of nitrided steel—almost as wear-resistant as carbide; pressure lubrication of ways; lead screws and nuts made from nitrided steel and aluminum bronze, respectively, combining to offer low coefficient of friction, abrasion resistance and hardness; and dust protection devices.

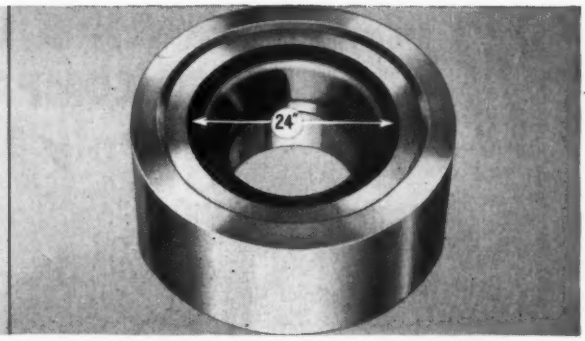


Special design features of the No. 2 Moore Jig Grinder insure permanence of accuracy.

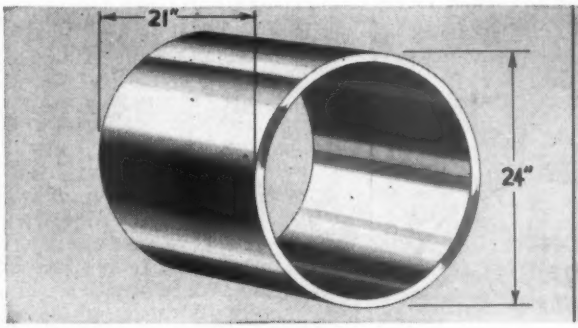
ACHIEVING GREATER ACCURACY QUICKLY is the job of Moore Jig Grinders and Moore Jig Borers. Both make possible accurate lead screw settings within .0001". This team will produce precision holes, contours and surfaces *in your shop* at minimum cost. For detailed catalogs, write to: Moore Special Tool Company, Inc., 726 Union Avenue, Bridgeport 7, Conn.



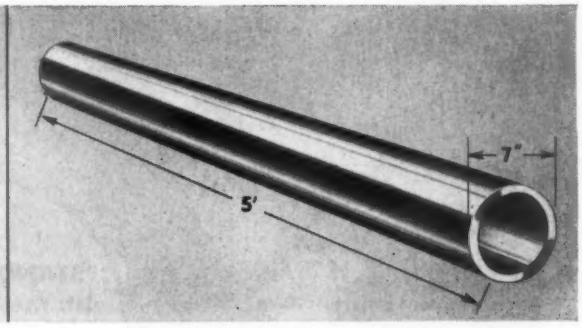
Solid carbide punch used in the cold extrusion of steel.



Ring dies up to 24" I.D. produced one piece.



Carbide cylinders up to this size produced one piece.



Carbide cylinders up to this size produced one piece.

2-Ton Cemented Carbide pieces can solve your toughest wear problems

New manufacturing facilities at the Carboloy Department of General Electric Company are capable of producing pieces of cemented carbide up to 4,000 pounds, including –

large die sections

rolls for rolling strip steel

large punches for cold extrusion work

large, wear-resistant linings for brick molds

When you replace present parts–large, medium size or small, with Carboloy cemented carbides, maintenance costs come down, production goes up.

Carboloy engineers are ready to assist manufacturers and diemakers to determine where and how Carboloy cemented carbides can cut costs, boost production. Write for this free service.

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Could large pieces of cemented carbide reduce costs in the following applications:

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Company_____

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NOW! LOW COST, FAST OPTICAL INSPECTION!

Here's how you save *every way* with this new Bausch & Lomb Bench Comparator. Save inspection costs—expensive holding fixtures no longer needed for most work. Save inspection time—no complicated set-up. Simply lay most kinds of work on table . . . see accurately magnified silhouette at eye level on 10″ screen—biggest screen, with biggest field, in this low price range. Makes accurate inspection so easy that a new operator can quickly keep pace with capacity production. Often reduces many complicated measurements into one easy, fast visual check. Save by nipping costly production errors in the bud. And of course you save on purchase price—a workable unit for only $765. Put this new, dependable B&L Bench Comparator to work on *your* production.

Make fast, accurate measurements with the easily attached micrometer stage. (Optional at small extra cost.) Reads to 0.0001″.

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CIRCLE INFORM-A-GRAM KEY NO. 16

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FROM THE RESEARCH FRONT

★ ★ ★ ★ ★ ★ ★ ★

RESEARCH AND DEVELOPMENT IN AERONAUTICS

In recent years progress in aviation has become increasingly dependent upon research and development in the physical sciences and engineering. Today, with the current emphasis on airborne defense, American industry and government are cooperating in an extremely broad nationwide program of scientific investigation and engineering adaptation directed toward the production of faster, safer, and more reliable aircraft.

As part of this comprehensive effort, the National Bureau of Standards conducts a great diversity of individual projects relating to aeronautics. With a broad background and extensive research facilities in the various sciences and branches of engineering, the Bureau is frequently called upon to undertake specific research and development projects for other governmental agencies. Examples are current studies of turbulence in supersonic wind tunnels for the NACA and of aircraft lighting for the Navy Bureau of Aeronautics. Also, as custodian of the national standards of physical measurement, NBS carries on research leading to improved methods of measurement and calibration which are often of value in aeronautic instrumentation.

High-Temperature Materials

The combustion products in the newer and more powerful aircraft engines—particularly jet engines—are hotter and more destructive than those in the engines of a few years ago. At the same time the increased demand for highly heat-resistant alloy

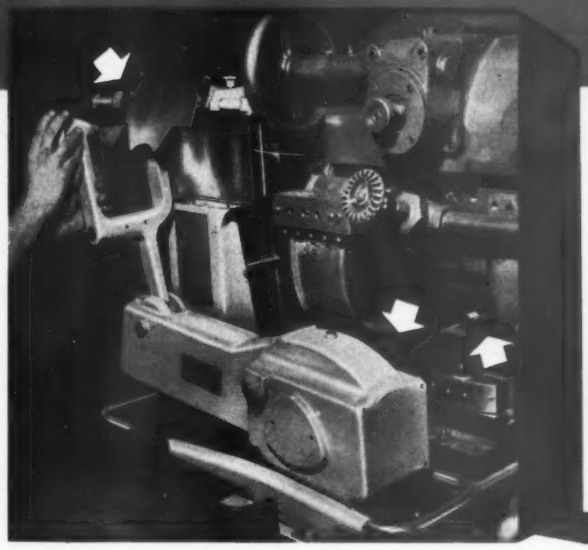
. . . *Continued on page 21*

NOW for the first time!

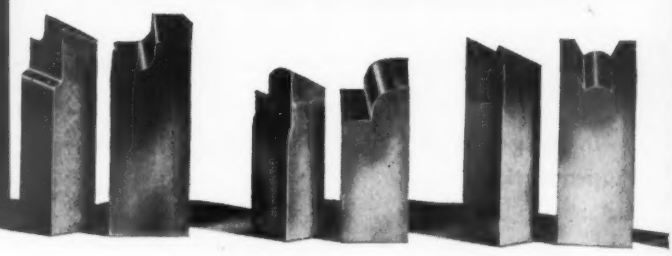
RELIEF GRIND FORMED CUTTING TOOLS

QUICKLY • EASILY • ECONOMICALLY without Lengthy Calculations

THE REVOLUTIONARY NEW PRATT & WHITNEY Relief Angle Compensating



Diaform WHEEL FORMING ATTACHMENT



Here is the most important advance in the making of formed cutting tools in nearly a century! This new model DIAFORM Wheel Forming Attachment is equipped with the unique Relief Angle Compensator that works from a simple, **true-to-form** template to provide complete, accurate compensation for all front and side relief and top rake angles normally required . . . even when cutting aluminum alloys, plastics, wood etc. Lengthy calculations, trial-and-error, projection drawings and distorted templates are eliminated; important savings in time and effort are realized.

Operation is simple. The template (prepared to the **exact** contours and dimensions of the finished product multiplied 5X or 10X) is mounted on the carrier. This assembly, which is equipped with graduated scales, is tilted to the included angle of both the front relief and the top rake; for side relief, the carrier is swiveled to the desired angle. The operator has now only to follow the template with the tracer bar using the guide knob, and the truing diamonds form the grinding wheel accurate to "tenths" and correctly compensated.

TAKE ADVANTAGE OF THIS NEW SCIENCE IN CUTTER RELIEF GRINDING . . . SEND NOW FOR COMPLETE INFORMATION — **Just fill in and mail the attached coupon . . . or write on your Company letterhead.**

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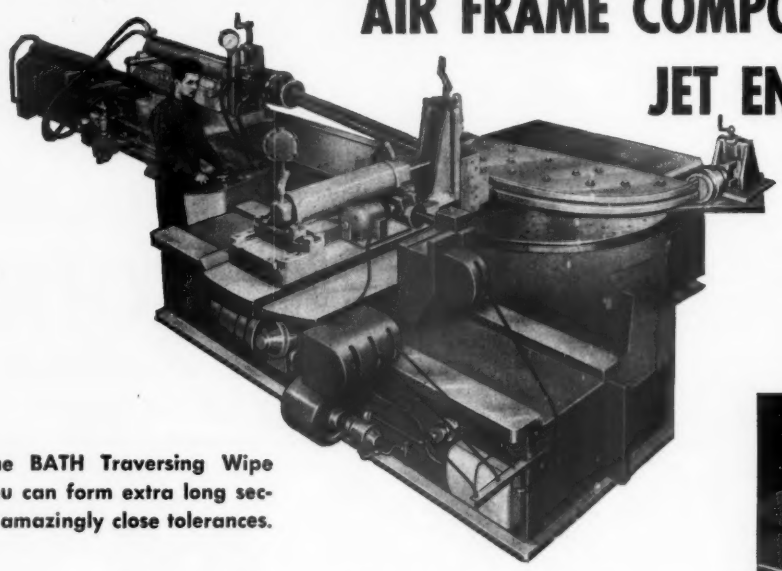
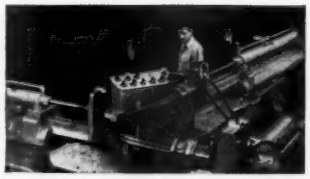
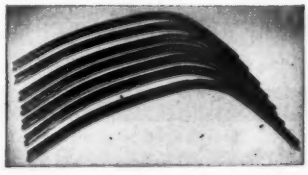
NEVER BEFORE SUCH VERSATILITY IN STRETCH FORMING

AIR FRAME COMPONENTS AND JET ENGINE RINGS



With the BATH Traversing Wipe Shoe you can form extra long sections to amazingly close tolerances.





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4. ***OPERATOR SAFETY*** with a 12 year record.
5. ***TRUE RINGS*** held to machining tolerances.
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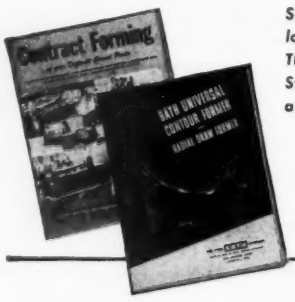

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CIRCLE INFORM-O-GRAM KEY NO. 18

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Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

AUTOMATIC PRESSES

by T. W. Bannon
Chief Engineer
CLEARING MACHINE CORP.
Chicago, Illinois

THE WORD "automation" was coined by the automotive industry a few years ago. Basically, it means automatic handling of parts and materials as they go through the production process. It is a way to increase productivity, obtain maximum effectiveness from equipment, and eliminate many safety hazards. It has increased product quality and reduced production costs. Actually, it is a step in the direction of the not too distant push-button factory.

Automation is no longer new in machine tools, and is particularly not new in presses. Automation principles were first applied to the presses themselves and later to the mechanisms for feeding and unloading them.

It started with an idea to use combination tools or dies on single action presses so that more than one operation could be performed on a single workpiece. After that came double and triple action presses as well as multiple station presses. Essentially, the double and triple action presses combined the function of several presses. Still later, so called transfer feed presses were developed. In this type of press a number of operations are performed in a straight line; transfer presses have unlimited possibilities for combining blanking, drawing, and trimming operations. Still later, cycling times on presses were stepped up, and recently underdrive pres-

. . . *Continued on page 22*

*Presented as part of the panel on automation at the 18th Annual Machine Tool Electrification Forum, sponsored by the Westinghouse Electric Corporation, Buffalo, New York.

Big work—bulky shapes—heavy jobs—all can be drilled quicker, easier on the Sibley Model E-25 Drilling Machine. 22″ x 30″ table; 25″ swing; pedestal jack supports table; variable speed drive for drills 1/8″ to 1″; table alignment to spindle—.0007″ in six inch radius; 1½ h.p. motor; convenient speed control; tachometer indicates exact spindle speed.

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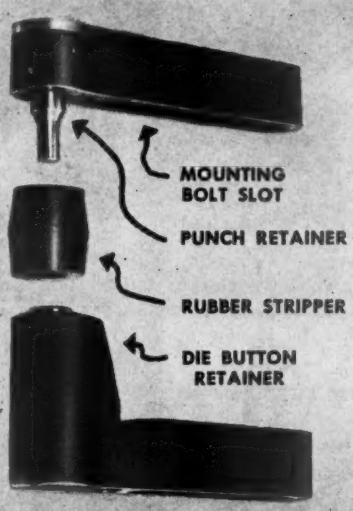
CIRCLE INFORM-A-GRAM KEY NO. 19

New PUNCH & DIE BUTTON POSITIONING Flexibility with R-B Flex-Mount RETAINERS

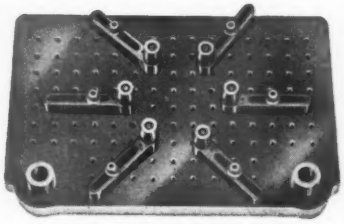


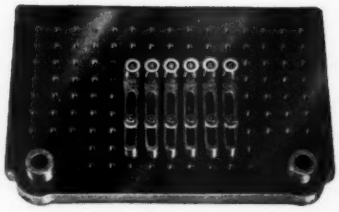
Cut your set-up time for short production runs on light gauge metals . . . R-B Flex-Mount Retainers permit quick, easy and flexible mounting of punches and die buttons. For, Flex-Mount Retainers are easily bolted in any desired position on T slotted or drilled and tapped commercial die sets.

Standardized R-B punches and die buttons (round, square, oblong or special shapes to customer specifications) are used in these retainers. Stripping is accomplished with R-B rubber strippers or R-B rubber covered springs to eliminate costly metal strippers, retainer screws and springs.

TYPICAL Flex-Mount POSITIONING Flexibility

Shown are but two of an almost unlimited number of mounting arrangements that can be made with Flex-Mount Retainers.





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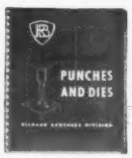

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CIRCLE INFORM-A-GRAM KEY NO. 20

. . . Research, from page 16

parts has brought about an urgent need for minimizing the strategic metal content of alloys. The application of protective ceramic coatings has made possible the use of heat resisting alloys of much lower strategic-metal content than would otherwise be possible. For example, a coated 18-chromium, 8-nickel steel is now used for jet engine combustion chamber liners instead of a 78-nickel, 14-chromium alloy.

During World War II, NBS pioneered development of the first high-temperature ceramic coating for steel to be produced commercially on aircraft parts. Since the war the Bureau, working under NACA sponsorship, has developed coatings for heat resisting alloys that are required to withstand considerably higher operating temperatures than could be met by mild steel, even when coated. More than a score of companies are now producing the coatings and finding new uses for them. Estimated savings to the Government run to several millions annually.

Under Air Force sponsorship, the Bureau is now studying cermets for turbine blade use and as flameholders for afterburners in jet planes. Other current investigations deal with special refractory porcelains for possible use under severe high-temperature conditions as nozzles for rockets and as turbine blades.

Aircraft Plastics

Work on transparent and laminated plastics, dopes, and coatings for aircraft use has been conducted by NBS for the Navy Bureau of Aeronautics since 1933.

With the increasing use of laminated plastics in aircraft, a need has developed for more comprehensive information on the properties of these materials in order to evaluate them for aircraft application and to prepare suitable specifications. To provide the necessary data, NBS has conducted an extensive program, sponsored by the NACA, on the properties of plastic laminates. Studies have been made of the effect of simulated service conditions, fuel immersion, and extreme temperatures on these materials.

. . . Continued on Page 32

Gorton Pantograph Does Job 7 Times Faster

In only 40 minutes this tracer-controlled pantograph cuts and blends a thermal slot in an 8-foot steel propeller blade — a job that requires 5 hours 10 minutes by other methods. This is typical Pantograph performance — one of hundreds of examples.

Gorton Pantography Brings *Creative* Production to Your Plant

What's *your* problem in machining? Depend on Gorton Pantography to help you *create* a new production method if your problem falls into any of these categories:

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Inside profiling	Counterboring
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MATERIALS
Ferrous metals
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Gorton Pantography works in two or three dimensions, in all directions on a horizontal plane, and vertically. It uses enlarged masters, templates or patterns — easily and inexpensively made. Normal operation takes advantage of the reduction ratio principle for increased accuracy in the work piece — an exclusive pantograph benefit.

Whether a dozen or a thousand pieces, each is identical in shape and tolerances to the first. Operation during cutting cycle is manual or automatic, and work piece size varies from the diameter of a dime to areas as large as ten feet.

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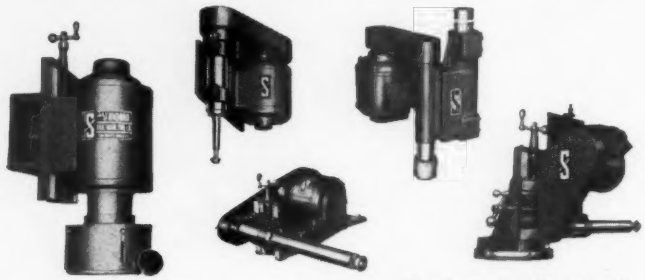
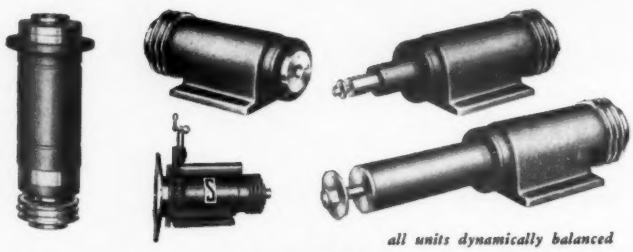
CIRCLE INFORM-A-GRAM KEY NO. 21

precision motor driven spindles or work heads



all units dynamically balanced

precision belt driven spindles or work heads



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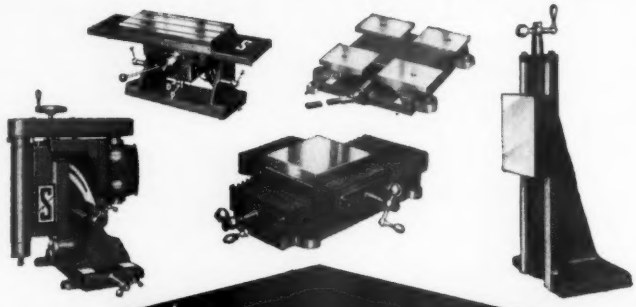
. . . and precision machine tool attachments



INCORPORATE THESE STANDARD UNITS INTO YOUR SPECIAL MACHINE DESIGNS

Shown here is only a part of STANDARD'S complete line of precision spindles and attachments including Traverse, Slides, Feeds, Tables; manual, air or hydraulic. Before designing any special machines or equipment, it will pay you to consult STANDARD and see how versatile and adaptable their line is. Write for details today.

Standardize with **the STANDARD electrical tool co.**

MACHINE TOOLS

MT. HOPE & SIXTH STS. • CINCINNATI 4 • OHIO

CIRCLE INFORM-A-GRAM KEY NO. 22

. . . Month's Talk, from page 19

ses have been put into use to ease material flow and aid in maintenance.

Among the great strides made in feeding and unloading of the larger presses was the use of electronic devices to control the feeding in high speed blanking and drawing presses. Magnetic feeds and transfers have also come in for a considerable amount of deserved recognition.

Two or three examples of recent automatic presses will give some idea of the present status of press builders in their attempts to keep abreast, or in some cases ahead of, automation demands. For example, Clearing engineers designed and built a new kind of hydraulic press for the production of cartridge cases. A press which has to draw a shell to a final length of 24″ requires an unusually long stroke. The equally long return stroke necessarily slows down the cycle time. One way of reducing lost time is to produce at both ends of the stroke, eliminating lost motion from operating time. The Clearing Double End Press (see T & P, March 1953, p. 68) does just this and has a number of other automation features too. Each press has an automatic feed especially adapted to its function. Safety limit switches on the presses make certain that the case is properly positioned before the press will operate.

Three completely automatic shell forging units recently built by Clearing each consist of three automated presses and an automatic descaler. These presses forge a 75, 90, or 105-mm shell forging without a human hand touching the piece part. The machines run continuously and have a capacity of six shell forgings a minute. The presses are completely automatic, even to the point where the scale is cleaned from the dies and the lubrication furnished to the presses between each cycle.

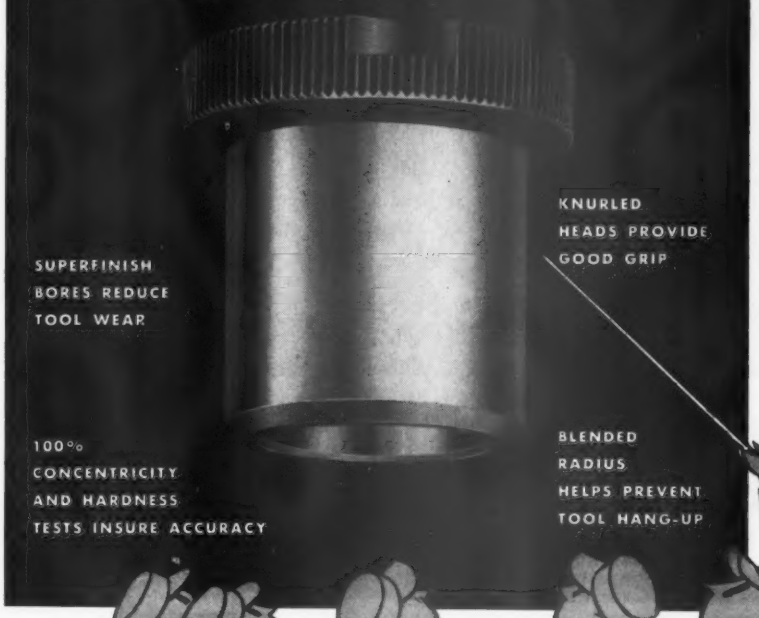
Those examples will give some idea of the present status of press builders in the automation race. What does the future hold for press automation?

Most presses to be built in the future will lend themselves even more to a complete automated setup. Trends in press design will be to complete stampings in

. . . Continued on page 30

UNIVERSAL DRILL BUSHINGS

INSURE PERFECT ALIGNMENT AND LONG LIFE OF PRODUCTION TOOLS


SUPERFINISH BORES REDUCE TOOL WEAR
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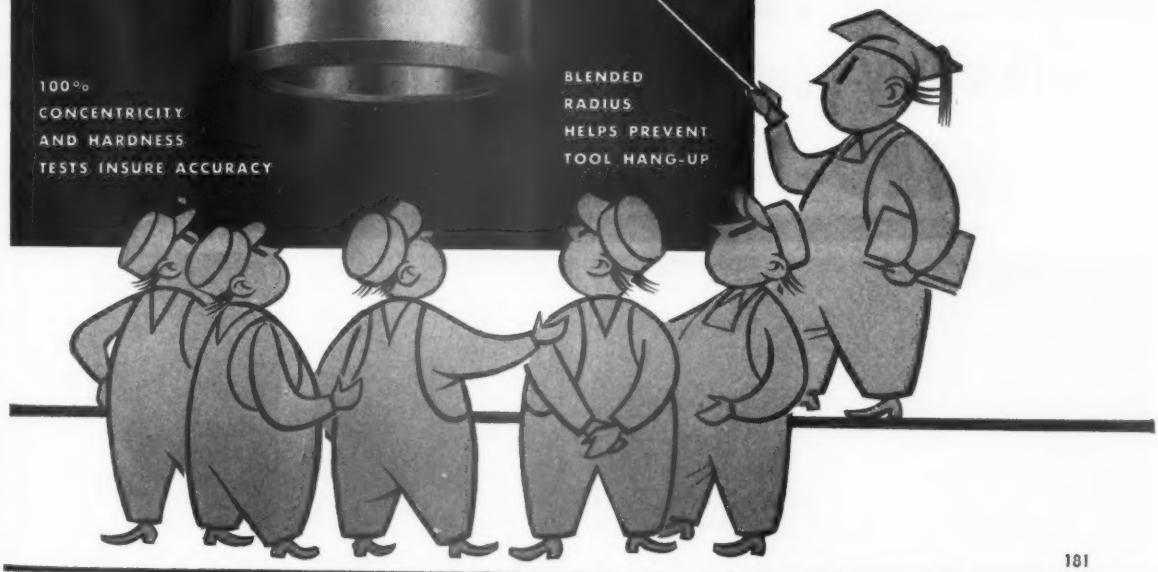
100% CONCENTRICITY AND HARDNESS TESTS INSURE ACCURACY
BLENDED RADIUS HELPS PREVENT TOOL HANG-UP

Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.



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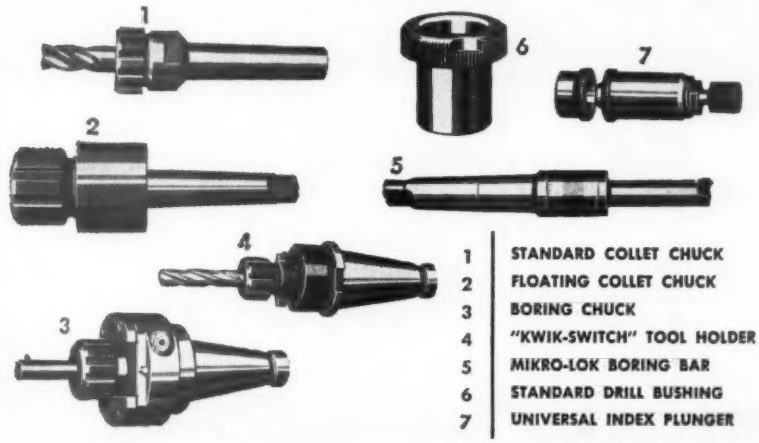


1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

CIRCLE INFORM-O-GRAM KEY NO. 23

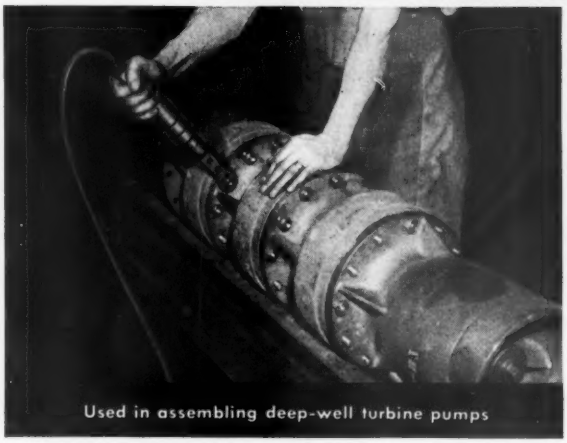
KELLER pneumatic ratchet wrench

Under refrigerator coil housing

Under automobile accelerator pedal

Bolting automobile fender to cowl

—the only power tool that can get into such HARD-TO-REACH PLACES!


Used in assembling deep-well turbine pumps

Fasten back splash to electric stove

Open end wrench attaches hydraulic tubing

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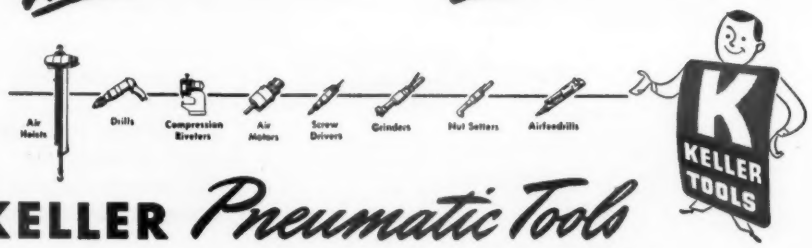

KELLER *Pneumatic Tools*

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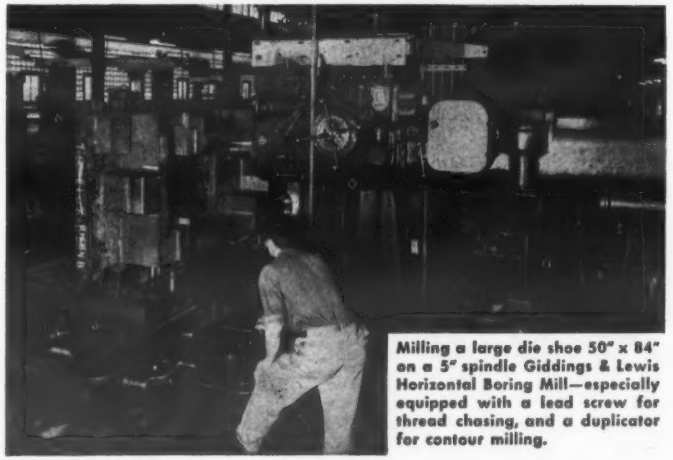
CIRCLE INFORM-A-GRAM KEY NO. 24

EFFICIENT Tooling

YOUR KEY TO

- simplified manufacturing operations
- increased stamping production
- lower costs—higher quality

Shown above—the assembly of various tools for the production of refrigerator and other parts.



Milling a large die shoe 50" x 84" on a 5" spindle Giddings & Lewis Horizontal Boring Mill—especially equipped with a lead screw for thread chasing, and a duplicator for contour milling.

EFFICIENT designs and builds
Dies, Tools, Jigs, Fixtures, Special Machines

Here's experience, skill and tooling know-how you can depend on. If you have "tough" stamping problems let us suggest an ingenious solution. Whether your tooling requirements are large, small, simple or complex, we can build dies that will save you time, trouble and expense in your production.

The EFFICIENT organization has the men, machines and large modern plant to serve you well. Our complete equipment includes tryout presses up to 300 tons capacity. Sample parts are delivered for your approval before dies are shipped.

EFFICIENT engineers will be glad to consult with you, work with you, or furnish quotations. Write or phone for complete information.

THE EFFICIENT TOOL & DIE COMPANY

9314 ELIZABETH AVENUE · CLEVELAND 5, OHIO · PHONE Diamond 1-5150

CIRCLE INFORM-A-GRAM KEY NO. 25

No matter what your tool requirements may be — no matter how often tools must be changed—Beaver Quick-Change Tool Holders and Adaptors will save you money.

Beaver's versatile Quick-Change Tooling permits the use of shell mills, face mills, end mills, drills, reamers, boring bars and other desired tools on any Beaver equipped machine without loss of accuracy.

Less than ten seconds per tool change gives you maximum production from each machine. Down-time reduced to an unbelievable minimum.

Beaver Quick-Change Tooling can be installed on most standard machines. Let us show you how it will benefit YOUR machine operations.

Write for our complete catalog #52.

Beaver TOOL AND ENGINEERING CORPORATION

2850 ROCHESTER ROAD • BOX 429, ROYAL OAK, MICH. Teletype - Big Beaver 648

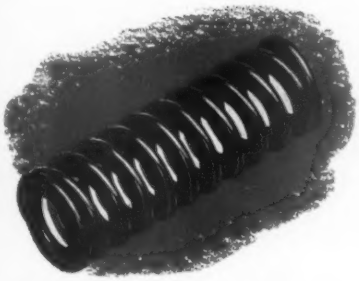
CIRCLE INFORM-A-GRAM KEY NO. 26

We asked hundreds of tool and die makers...

"What's wrong with the die springs you now use?"

Their answers sparked DIECO's metallurgical and design research...led to a complete new line that

out-performs others up to 3 to 1

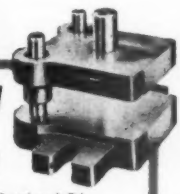


Working with leading spring specialists, Dieco engineers developed a complete new line of die springs which have licked the toughest spring problems.

Special steels were developed... special methods for treating them ...even special packaging methods to eliminate "growth" in transit.

Out of this field research and development came a line of more than 500 standard-size springs, in three distinct pressure classifications: Medium, Medium-High and High. For the first time, it became possible to "fit" the spring to the job at hand, to pick the precise pressure required for a given die action.

Now, satisfied users report that Dieco springs virtually eliminate downtime and wasted man hours due to die spring failure. If you have a tricky spring problem tying up your pressroom, call your local Dieco representative. He will be glad to help you pick the proper spring for the job. And to put an end to spring problems before they start... specify DIECO die sets and die springs.



Call your local DIECO office TODAY!

CLEVELAND	1400 Brookpark Rd., SHadyside 1-9000
PITTSBURGH	122 S. Sheridan Ave., EMerson 1-0440
DAYTON	Die Supply Sales Co., 311 Vermont Ave., MI 9691
BUFFALO	Die Supply Corp., 234 Carolina St., MAdison 1964
ST. LOUIS	Scott Special Tools, Inc., 1252 N. Kingshighway, FOrest 3454
DETROIT	20201 Sherwood Avenue FOrrest 6-2480

Write for Catalog No. 6-A

BLISS SINCE 1857

Industry's most complete line of die sets and die makers supplies

DIECO

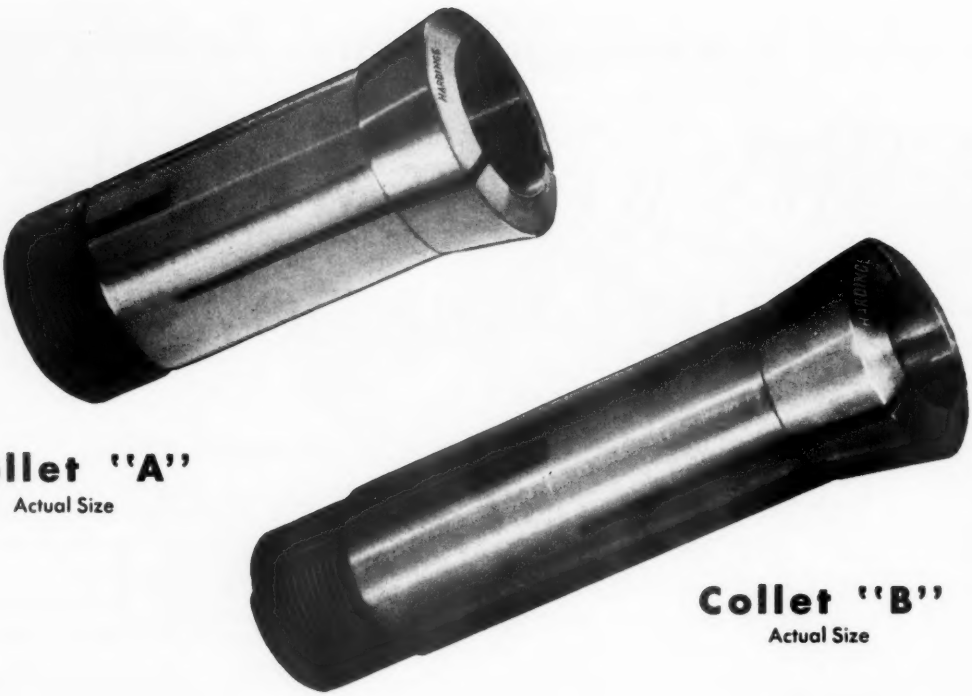
The DIE SUPPLY Company

1400 Brookpark Road, Cleveland, Ohio
a subsidiary of E. W. BLISS COMPANY

DIE SETS • GUIDE PINS

BUSHINGS • SPRINGS • SOCKET HEAD SCREWS • 5001 ITEMS

CIRCLE INFORM-A-GRAM KEY NO. 27



Collet "A"
Actual Size

Collet "B"
Actual Size

Can you identify these HARDINGE ELMIRA, N.Y. Collets?

Collet "A"

CAPACITY: 1" Round, 7/8" Hexagon, 3/4" Square
USED ON: Hardinge Lathes, Millers, Second Operation Machines, Chucking Machines, Index Fixtures and Sjogren Chucks. Also used with 10" South Bend, 10" Monarch, Sheldon, Rivett and Elgin Lathes; Schauer Polishing Machines; Mead and Zagar Fixtures.

Collet "B"

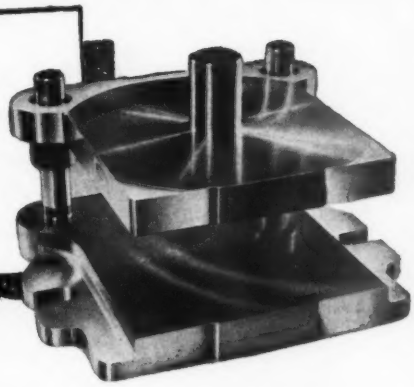
CAPACITY: 7/8" Round, 3/4" Hexagon, 5/8" Square
USED ON: 12" and 14" American; 14" Cincinnati; 12", 14" and 16" Hendey; 12", 14", 16" and 18" Monarch; 9", 15" and 16" Rockford; 12", 14" and 16" Sebastian; 14" and 16" Springfield Lathes.

Stock Delivery: Both Collets Carried in Stock for Immediate Delivery from Twelve Conveniently Located Warehouses. *Write Hardinge Brothers, Inc., Elmira, New York for Complete Bulletin 50.*

Answer: Collet "A" is a 5C Hardinge. Collet "B" is a 3H Hardinge.

CIRCLE INFORM-A-GRAM KEY NO. 28

World's fastest die set service in action



Here's where faster die set service begins, on Danly's high speed precision production lines . . . the finest mass production facilities in the die set field.

Here's where your order is received . . . in one of Danly's Branch Plants. Because all die components are close at hand, your order is filled immediately.

Now—Danly unites mass production techniques with the precision touch of craftsmanship to bring you the fastest die set service . . . ever.

Never before has there been a die set service as fast as the one that Danly now offers to you. Unique in concept, the system had its beginning some years ago when Danly originated its network of nationwide Danly Branches. Under such a system the main Danly Plant in Chicago provided thousands of *interchangeable* die set parts to Danly Branch Plants. It meant that such parts were easily assembled into standard die sets and then quickly delivered to meet the requirements of any tooling program.

But, as buyers recognized the convenience of Danly service, demands on the Chicago Plant grew to exceed capacity. The solution? . . . an unprecedented move in the die set field. Danly put die set manufacture on a mass production basis with no sacrifice of famous Danly precision. It was accomplished with amazing new facilities in the form of two complete production lines devoted exclusively to high speed, precision die set production. The next time you put one or a dozen Danly Die Sets on order, expect to get fast delivery from any Danly Branch, expect to get die sets unequaled in precision. You can expect it and you'll get it . . . when it's Danly.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

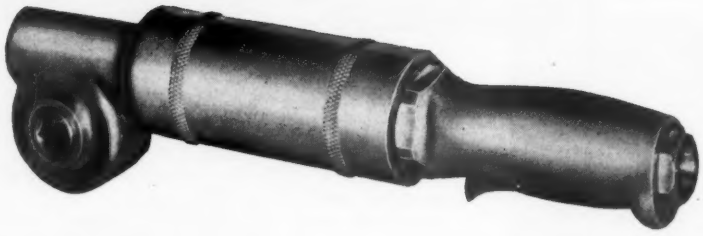
Fast, nationwide delivery from these plants

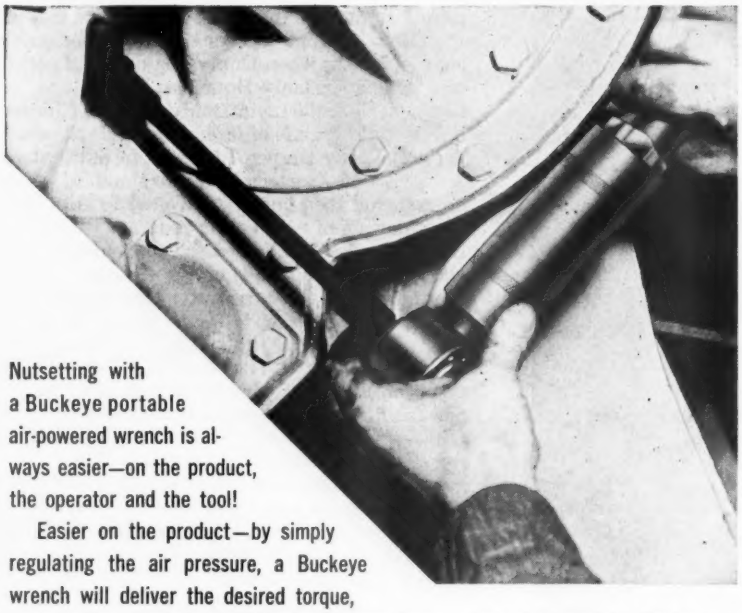
***CHICAGO** 50	2100 S. Laramie Avenue
***CLEVELAND** 14	1550 East 33rd Street
***DAYTON** 7	3196 Delphos Avenue
***DETROIT** 16	1549 Temple Avenue
***GRAND RAPIDS**	113 Michigan Street, N.W.
INDIANAPOLIS 4	5 West 10th Street
***LONG ISLAND CITY** 1	47-28 37th Street
***LOS ANGELES** 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 E. Wisconsin Avenue
***PHILADELPHIA** 40	511 W. Courtland Street
***ROCHESTER** 6	33 Rutter Street

***Indicates complete stock.**

in portable wrenches

YOUR BEST BUY IS BUCKEYE





Nutsetting with a Buckeye portable air-powered wrench is always easier—on the product, the operator and the tool!

Easier on the product—by simply regulating the air pressure, a Buckeye wrench will deliver the desired torque, up to maximum motor capacity. That means fewer rejects due to work spoilage.

Easier on the operator—there's no need to rely on the "feel" of the work to know when the job is done. Should greater torque be needed, the tool can be used, with the air on, as a ratchet wrench.

Easier on the tool—the Buckeye air wrench is the only tool of this type with power provided through planetary and worm gearing. The brunt of the work-load is divided over a much greater gear area. That means less tool wear, fewer and lower tool maintenance costs.

You'll find complete details and specifications in our Air Tools Catalog—may we send you a copy? If you like, we'll arrange a trial-test of a Buckeye angle wrench in your own plant, without obligation.

Buckeye Tools CORPORATION
DIVISION 19 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

CIRCLE INFORM-A-GRAM KEY NO. 30

. . . Month's Talk, from page 22

one or two presses. Feeding and unloading components will become standard equipment as will electronic controls for actuating the press. Or, perhaps, even the entire press line will be operated from one master control panel.

Cycling rates will be stepped up even higher. New methods of simplifying and combining operations will undoubtedly be developed.

The advancement of automation will not only depend on the press builders and machine tool builders but also on the users. To operate a fully automatic machine with complete automation to perform these complicated operations, skilled maintenance and operator personnel are necessary. If some electrical or mechanical trouble develops and there are no proper maintenance facilities at hand, it is possible that automation will not be found as useful as the old single purpose machines that used manual labor. This problem is, of course, well on its way to being solved in the large industrial centers where automation is not a new concept to production people. But automation will eventually reach the job shop level, and users and builders alike will have to supply some not-too-easy answers.

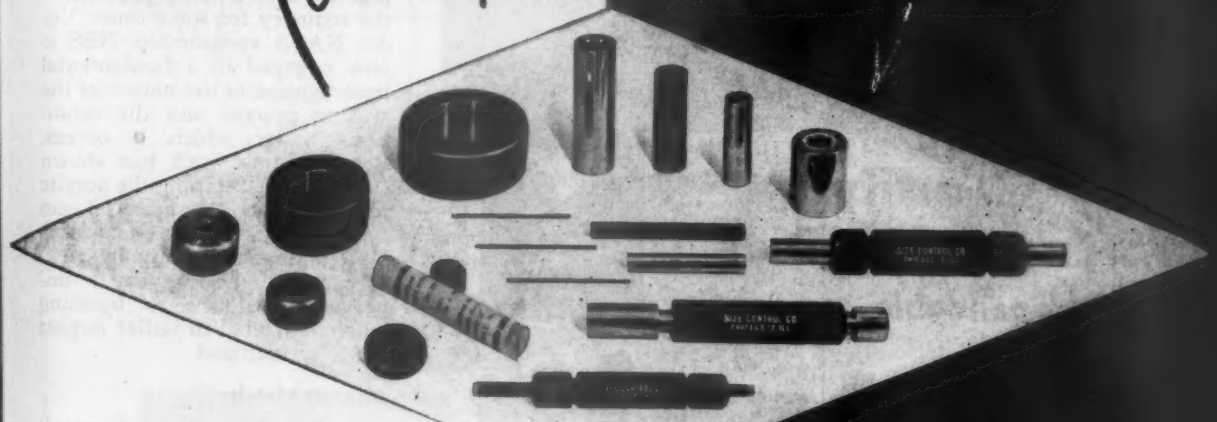
M. I. T. Will Hold Automatic Control Summer Program

Plans for a two-week special summer program on the Automatic Control of Machine Tools, to be held from August 23 to Sept. 3 in the Servomechanisms Laboratory at the Massachusetts Institute of Technology, were announced by Professor Ernest H. Huntress, director of the M.I.T. Summer session.

This special program supplements a two-week session on Machine Tool Technology which was conducted last month.

The program will be under the direction of Professor J. Francis Reintjes, director of M.I.T.'s Servomechanisms Laboratory in the electrical engineering department. Professor Reintjes will be assisted by other members of the laboratory staff.

Precision finishing with a Precision Abrasive



At the Size Control Company ... Chicago, Illinois

Precision gage production
presents a difficult finishing problem.
A fine, long wearing finish must be achieved just
as the piece is brought to exact size—there is no excess
material left for refinishing if a scratch develops. Only the finest, most
reliable abrasives can be used. That's why, at Size Control Company, they...

Finish with Diamond ... ELGIN Diamond!

ONLY ELGIN DIAMOND IN DYMO

is precision graded right in the Elgin laboratories

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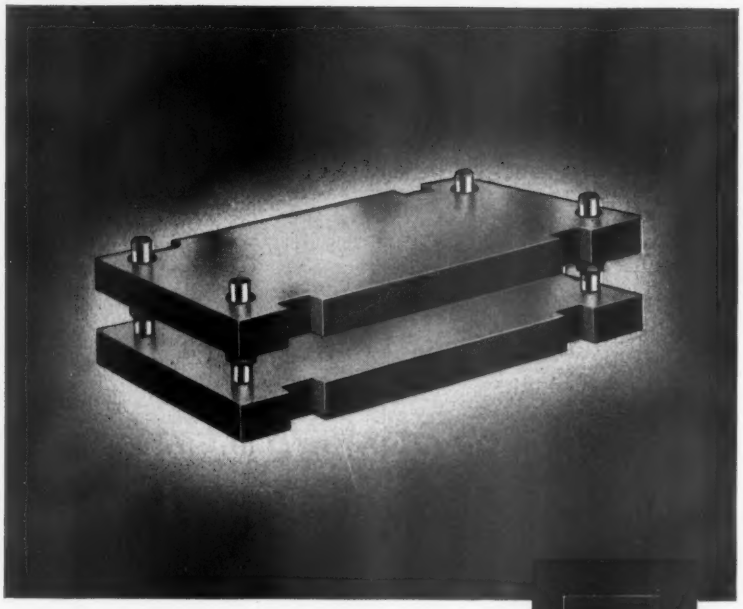

Fortify
Expensive Dies
with dependable, top-quality

detroit
die sets

Smallest cost of a mounted die is the die set . . . often only a fraction of the total. Saving a few dollars on a die set may run up other costs, such as in re-working the set in your shop, in mounting, in interrupted production. When you specify a Detroit Die Set you get the accuracy and the quality you have a right to expect . . . and without paying a premium.

Call "Detroit"

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DETROIT 2, MICHIGAN

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CINCINNATI . . . HU 7775	LOS ANGELES . . AD 7251	ROCK ISLAND, ILL. . 8-2814
CLEVELAND . . . TO 1-0860	MILWAUKEE . . GL 3-7170	ST. LOUIS . . . FR 1-6810
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DAYTON . . . HE 3042	MONTREAL, CAN. . GL 6126	TOLEDO . . . MA 4510
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DENVER . . . SH 2431		WASHINGTON, D.C. AD 4-5700

CIRCLE INFORM-A-GRAM KEY NO. 32

. . . Research, from page 21

Under the sponsorship of the NACA and the Air Force, NBS has undertaken a number of different investigations of glass-fiber reinforced plastics, which the Armed Forces have found adaptable to radomes and other parts of aircraft. It has been shown that close control of the many variables involved in production makes possible the fabrication of reinforced plastics with more uniform quality, greater strength, and improved electrical properties.

The crazing of the acrylic plastic glazing used in aircraft canopies has been a major problem to the industry for some time. Under NACA sponsorship, NBS is now engaged in a fundamental investigation of the nature of the crazing process and the conditions under which it occurs. Recently this work has shown that by hot-stretching the acrylic plastic sheets the material can be made essentially craze-resistant, taking on a laminar structure which also gives it improved resistance to bursting when subjected to bullet impact while pressurized.

Aircraft Metals

A large part of the Bureau's work in metallurgy has been specifically centered on aeronautical problems. Studies of the corrosion of aircraft alloys—aluminum, magnesium, stainless steel, titanium, and others—have been carried on for the Navy Bureau of Aeronautics since 1925, providing results of basic importance in aircraft design.

Considerable work has been done on the stress corrosion resistance of aluminum and magnesium alloys to determine their suitability for use in Naval aircraft. As new alloys and coatings or other protective processes are developed, the Bureau continues to evaluate them to determine their suitability for aircraft use. The effects of manufacturing and assembling processes—such as riveting, welding, and dimpling — are also studied.

A variety of other metallurgical investigations are carried on for the Bureau of Aeronautics. Failed parts are regularly submitted by the Navy for examination and diagnosis of the cause of failure. Recent investigations

. . . *Continued on page 130*

More than meets the eye

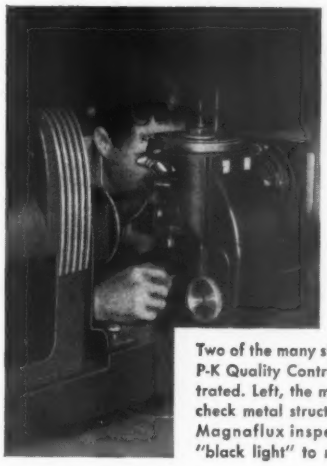
P-K Socket Screws, at a glance, may look substantially like those you buy from "habit." You have to "look *beyond* the hex" for the difference.

If you don't, you are buying with a "blind spot" that can block your way to *proved* benefits other buyers are using to advantage. Parker-Kalon's exacting Quality Control is only one of the advantages you don't see until you "look beyond the hex."

Look Beyond the Hex

Compare every detail of product and service. Compare for advanced design . . . for proved assembly strength . . . for buying aids, and supply service. Get all the facts, and try P-K Socket Screws. You'll find they take top rating in any test.

Get samples, information from your P-K Distributor, or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick Street, New York 14, N. Y.



Two of the many steps in the exacting P-K Quality Control routine are illustrated. Left, the metallograph test to check metal structure, and right, the Magnaflux inspection, employing "black light" to reveal any defects.

FOR TOP QUALITY and tolerance gaged to your most exacting specifications — and guaranteed.

FOR ADVANCED DESIGN that speeds assemblies — makes them simpler, stronger — and saves errors.

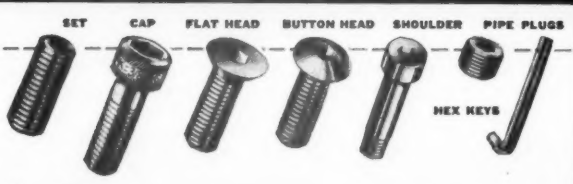
FOR ASSEMBLY STRENGTH okayed in a million punishing tests by thousands of satisfied users.

FOR PLANNING AIDS and buying data patterned to your special needs, plus advice on assembly.

FOR SUPPLY SERVICE set up for fast action and lower purchasing expense — by local Distributors.

FOR ANY STYLE OR SIZE You'll find any Socket Screw you need in P-K's complete line. Hex Keys in all sizes, and several handy sets.

PARKER-KALON SOCKET SCREWS



GET ALL THESE ESSENTIALS OF COST-WISE ASSEMBLY GET P-K

In Stock... see your nearby P-K Distributor . . . your local Supply and Service Specialist

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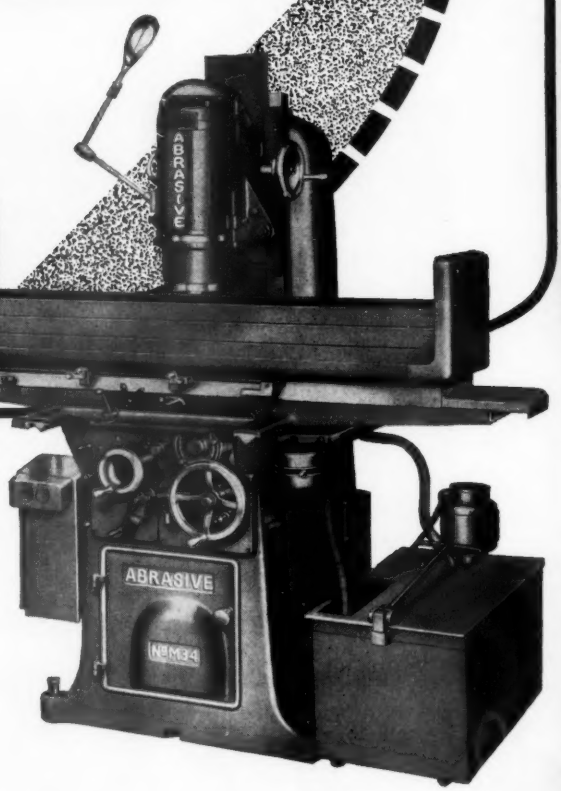
Grind Flat Surfaces FAST



The Abrasive No. M34 Vertical Spindle Surface Grinder puts the face of a 6" segmental grinding wheel to work — grinds pieces up to 4" wide by 24" long in a single pass. This grinder is up to 400% faster than a comparable horizontal spindle machine . . . its 5 h.p. motorized spindle brings parts down to size fast and economically. Work capacity is 24" longitudinal, 8" transverse, 12" vertical . . . the only grinder in this capacity range with a vertical spindle. For complete details, write for Abrasive No. M34 Catalog *today*. Abrasive Machine Tool Company, [illegible] Dunellen Road, East Providence 14, Rhode Island.

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ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

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high production
AIR-HARDENING
Die Steel*
Manufactured under
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Tests show as much as
50% reduction in
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No change in physical properties or in the heat
treatment normally associated with D-2 type die steel.
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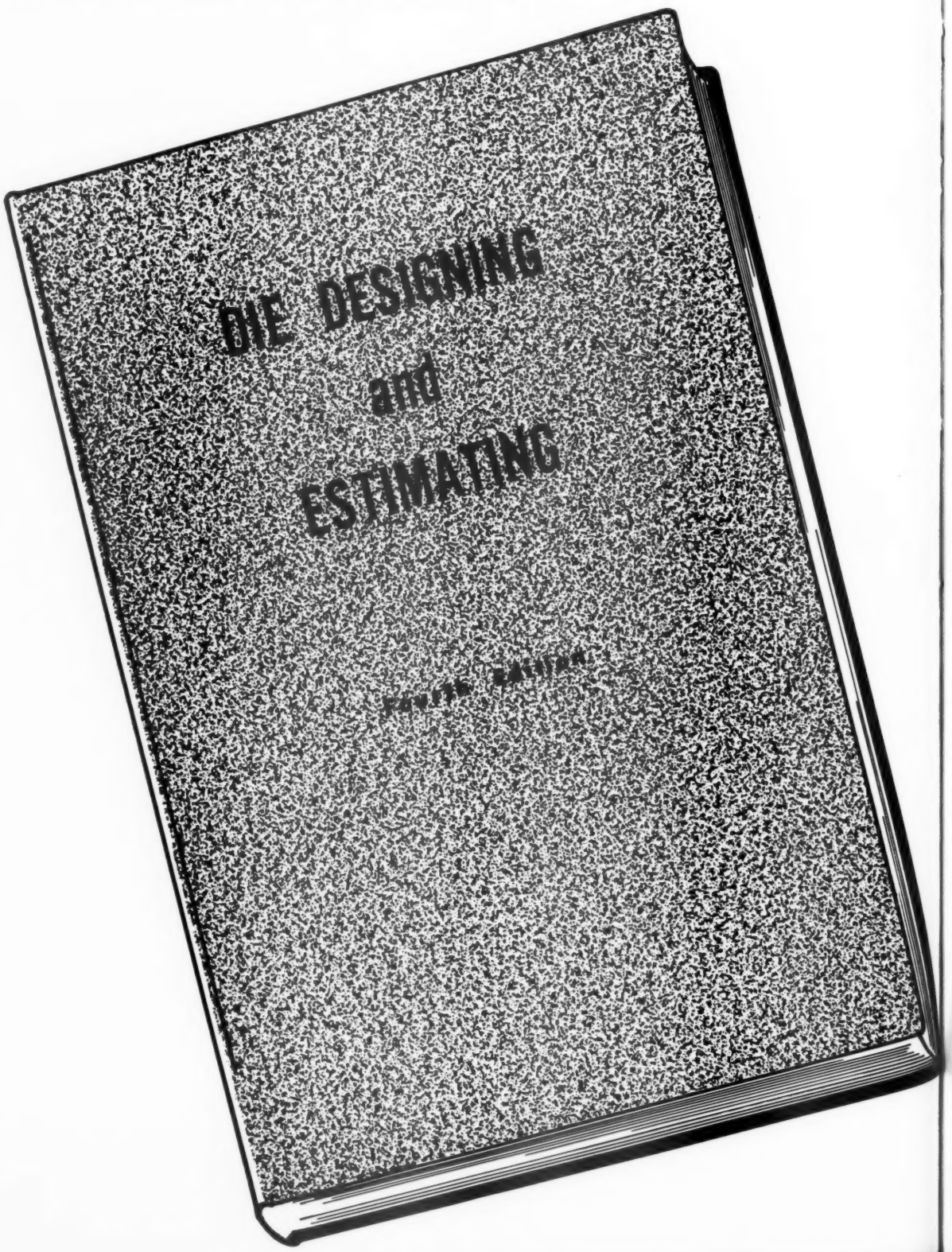

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In this new edition are:

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2. Additional material on temporary and short-run dies and selection of die materials.
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The new DIE DESIGNING and ESTIMATING will be profusely illustrated and will contain many charts and graphs.

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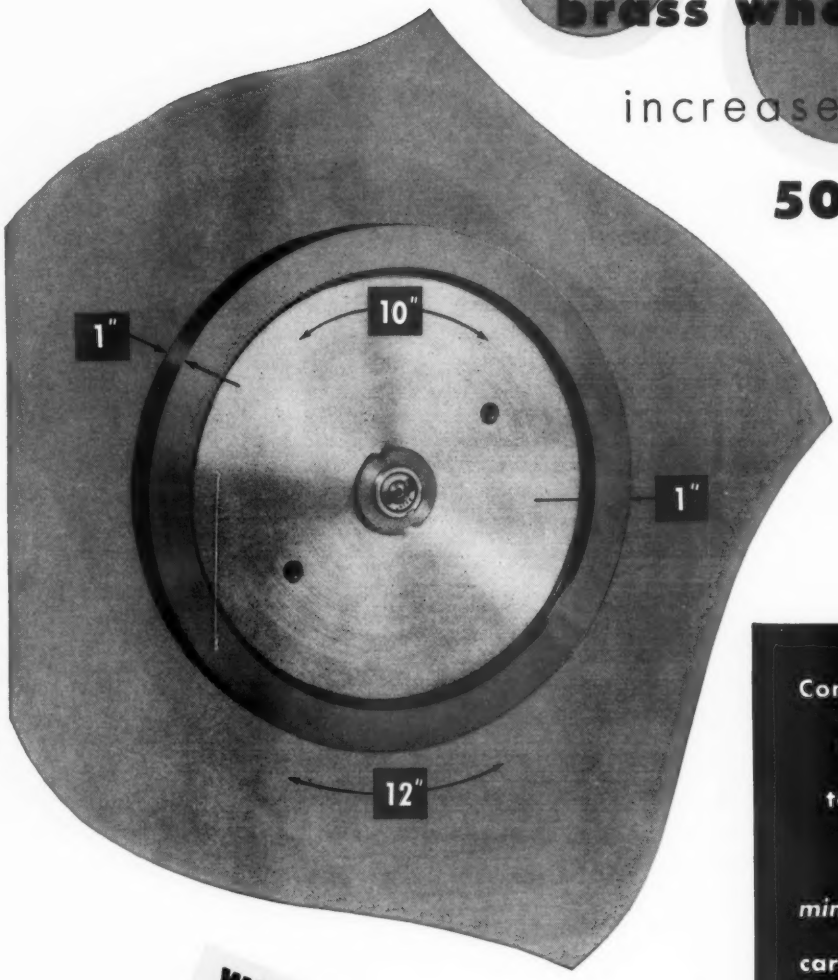
insert tools with this $45

brass wheel and

increase tool life

50 to 200%



Ave. cost per tool sharpened:

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Convert from abrasive and diamond wheels to an Elox brass wheel and save 50 *minutes* sharpening 20 carbide insert tools.

WE CAN SHOW YOU HOW!

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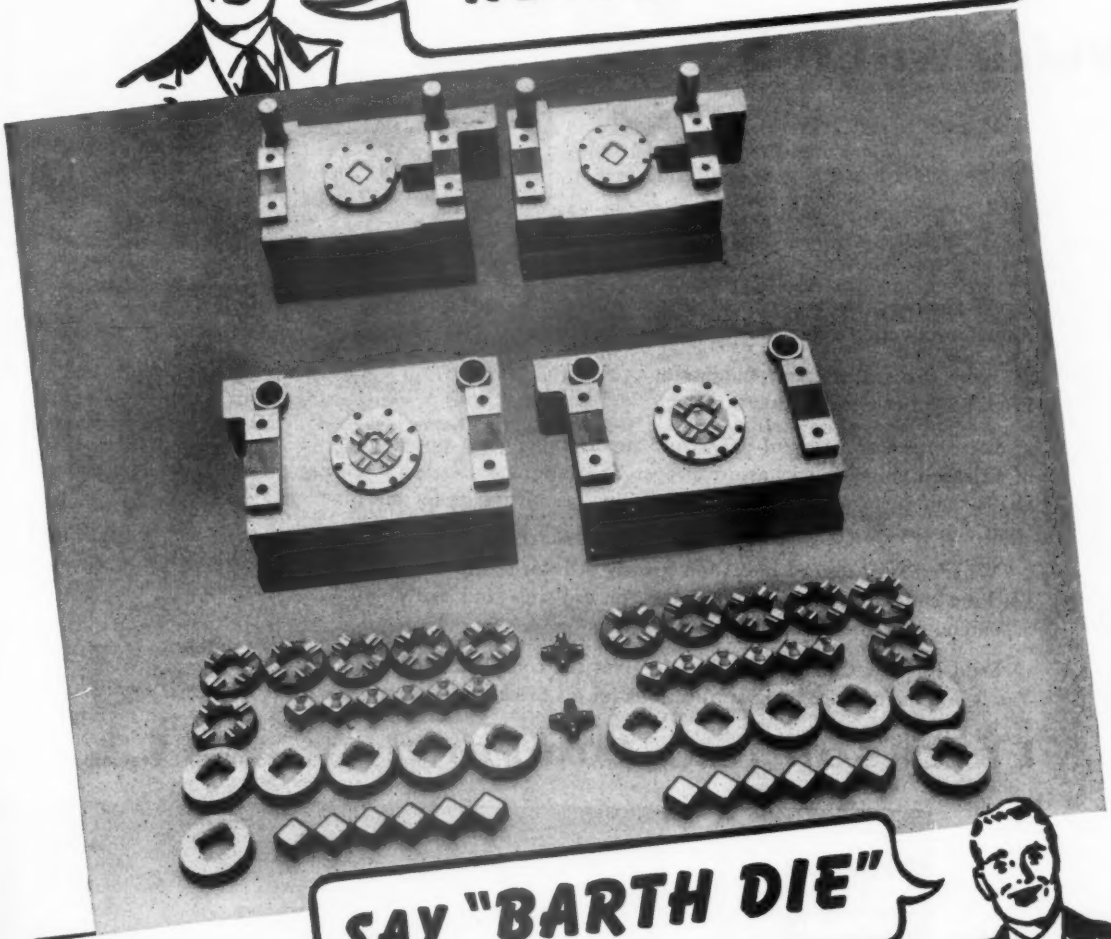

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1 — maximum production.
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Which will it be—?

Price
Cost

As you well know, *price* of new equipment is only the beginning. Actual production savings determine real equipment *cost.*

From this realistic *cost* standpoint you can't beat Erickson collet chucks. Here's why:

Guaranteed accuracy of .0005" and superior gripping power of Erickson collet chucks assure proper drill alignment. Drills then cut evenly on both cutting lips permitting faster machine feeds and proper speeds . . . give more holes per grind.

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Send for new Catalog K today! It gives the complete Erickson story. You'll find many interesting applications for all Erickson holding tools.

A-5592

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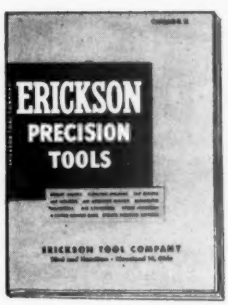

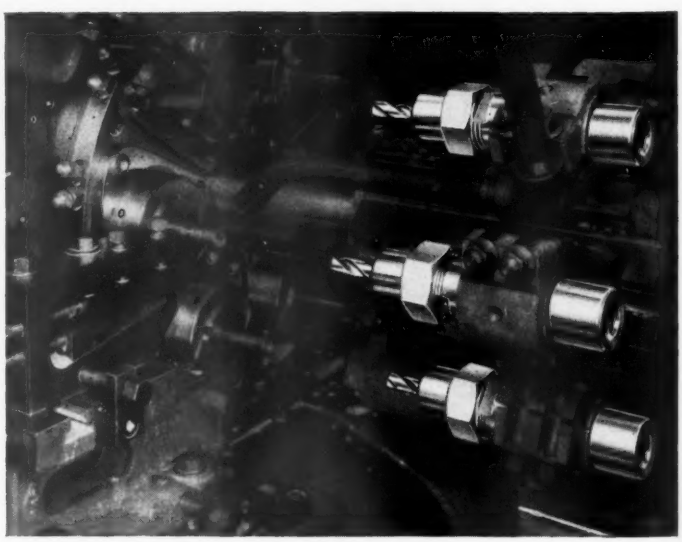

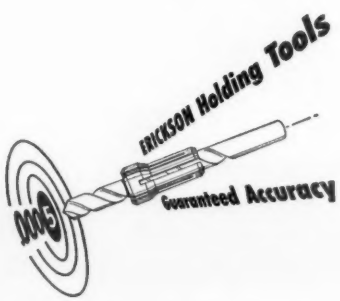

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CIRCLE INFORM-A-GRAM KEY NO. 40

automatic tooling and production

"Every manager in business and industry must acquaint himself with the developments in automation or risk being left behind in this fast-moving technical era." Thus spoke W. A. Wildhack, chief instrument engineer of the National Bureau of Standards before a recent meeting of Philadelphia businessmen.

At the same meeting, Henry F. Dever, president of the Brown Instruments Division of Minneapolis-Honeywell Regulator Company told the assembled industrialists that he was disturbed at the "over-emphasis" on the "gee-whiz" possibilities that excite the optimist and encourage prophecies of robotized labor.

We feel obligated by the implications in the words of these authorities to pin-point definitively our editorial treatment of, and our readers' stake in, automation. We want to point out that it is our readers who are responsible not only for today's accomplishments in metalworking tooling and production but for continuing progress toward the goals of increased productivity and lowered manufacturing costs; that the job they have to do of integrating the tools of automation with established metalworking operations represents, in its own right, a fast-growing multi-million dollar activity.

When Mr. Wildhack speaks of "Every manager in business and industry . . .", he is referring, across the board, to everything from petroleum processing and beer bottle capping to complex analog and digital computers. In view of the increasing diversity and complexity of automation applications the technical reader is becoming harder put, within his budgeted reading time, to find the automation progress reports and know-how pertinent to his specific interest.

This is why TOOLING & PRODUCTION's treatment of automation is held to practical, down-to-earth disclosures of the machines, controls, tooling and methods which are used successfully to combine such basic metalworking operations as turning, drilling, milling, threading, blanking and forming into an uninterrupted manufacturing progression.

That has been our policy, and, with the greatest interests of our readers foremost, it is the policy to which we shall hold.

The one time that we could have been accused by Mr. Dever of indulging in a "gee-whiz" approach to automation was when, in our March 1953 editorial, we predicted sandwiched assemblies of printed circuits in electronics manufacture. Luckily, within a few months the joint disclosure by the Navy and the Bureau of Standards of "Project Tinkertoy" turned our fancy into reality.

Metalworking applications of automation are two-fold, being (1) to products currently in production, and (2) to products being readied for manufacture. The big jobs in automation which our readers are engaged in are those of converting isolated tooling and production operations into automatic tooling and production sequences.

This means determining whether to specify a complete automated line as a "package", to procure individual transfer machines for grouped operations, or to augment existing machine tools and work stations with automatic tooling for feeding, transporting, joining, and removing the workpieces.

Also entering into the determinations governing their choice of automatic tooling and production equipment are the factors of longevity of product — style-wise and market-wise — vs. the life expectancy of the automated installation.

Another phase of the automatic tooling and production picture that is of vital interest to our readers, and which further multiplies the market potential for the tools of automation, is the scaling down of workpieces which can be automated at a profit. Whereas much of the original endeavor in automation was to take the heavy muscle out of human labor — the "toting" and positioning of heavy engine blocks and transmission housings — it is now well established that in the production of parts as small as those involved in domestic appliances, plumbing fittings, and automotive accessories, there is ample economic justification for automatic tooling and production techniques.

Editorial features which we have scheduled for early presentation will show how the successful practice of automation — automatic tooling and production — can reduce the cost of the product, conserve manpower, improve quality, increase productivity, reduce in-process inventories, and improve working conditions.

E. Willard Pennington

editor

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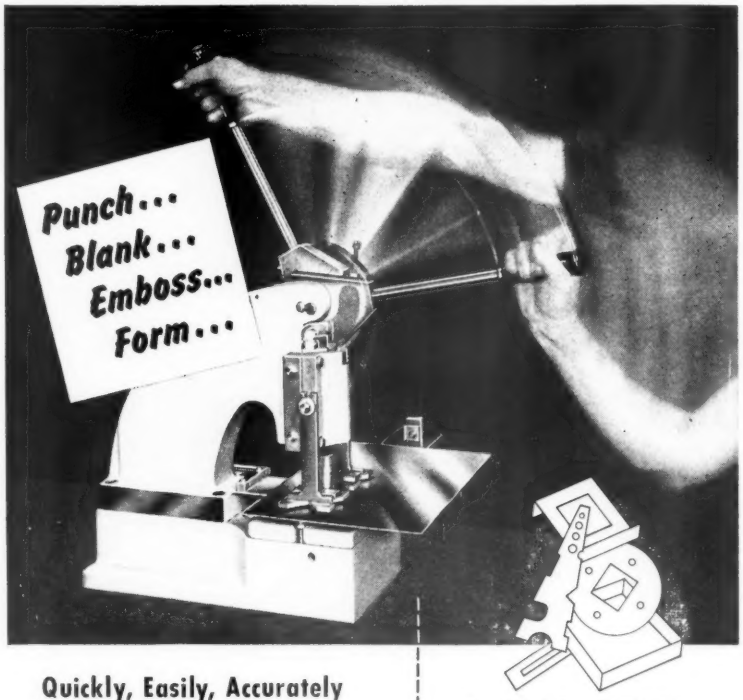

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CIRCLE INFORM-A-GRAM KEY NO. 42

— FEATURES —

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AERONAUTICS RESEARCH. "NBS Research and Development in Aeronautics" 16

This article is a comprehensive report on the activities of the National Bureau of Standards in the field of aeronautics.

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Mr. Bannon traces the development of automatic presses from the inception of the single action press and combination tools and dies, through the double and triple action presses and the multiple station presses.

TOOL STEEL. "From Free Machining to Machining for Free" 44

A highly significant development in tool steel manufacture has resulted from a research program at Latrobe Steel Company. Two new high alloy tool steels containing sulphide additives are freer machining.

CAST ALUMINUM. "Cast Aluminum Plate—a Versatile Tooling Material", by Kirby F. Thornton, Aluminum Company of America 46

General industry is becoming interested in the application of cast aluminum plate for tool and jig plate work since aircraft industry perfected its use as a tooling material.

PRESSES. "Presses Plus Dies = Stampings" 49

From plants across the country, these picture-caption scenes selected at random typify the vital role that presses play in our ever-increasing national productivity.

PRESSES. "Press Working the Aluminum Alloys" (Continued), by Lester F. Spencer, Kensington, Conn. 50

Mr. Spencer continues his discussion of the advantages and disadvantages in press working aluminum alloys. He suggests corrective methods for eliminating such objectionable conditions as, wrinkling, buckling, and fracturing.

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AIR POWER. "Air Power Unlimited —Serves Broad Industrial Field", by Lester F. Spencer, Kensington, Conn. 54

Of all the applications of compressed air in the metal-working industry, the use of air-operated tools is outstanding. Some of the most widely used air tools are discussed by Mr. Spencer.

AIR POWER. "Engineering the Compressor Installation for Maximum Efficiency", by Carl F. Benner, Associate Editor 62

In order to obtain the benefits and advantages of compressed air equipment intelligent planning, selecting and installing are required. Causes, effects and remedies of low air pressure are discussed.

SAW BLADES. "High Speed Steel Saw Blades", by H. J. Chamberland, The DoAll Company 85

Tests show that the new high speed band saw blades reduce sawing costs by more than 30%.

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STICK AROUND FOR THIS!

Is your name on the back cover of this magazine?

If not, you may miss the rest of our AIR POWER FOR METALWORKING series that started on Page 54. This series will continue through the next 5 issues and will cover the installations, maintenance and application of air systems. You won't want to miss a single one of these or any other "know-how" articles soon to be published.

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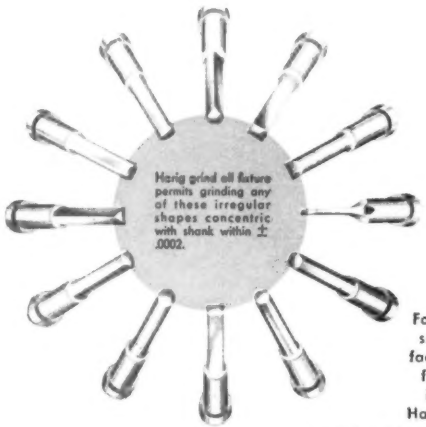

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CIRCLE INFORM-A-GRAM KEY NO. 43

. . . the editor visits a tool steel mill

FROM FREE MACHINING TO MACHINING "FOR FREE"

WHEN THE METALLURGY of a cutting tool is so changed as to result, at no additional cost, in not only a freer machining material from which to initially fabricate the tool, but in a cutting tool which, in turn, is capable of removing more metal between grinds and of being sharpened more times — surely it can be said that the free machining accomplishment has paid-off with an extra dividend in the form of machining "for free".

This dividend has been experienced by users of Latrobe Steel Company's new XL and FM steels which are high alloy tool steels containing sulphide additives — a highly significant development in tool steel manufacture.

As in so many research and development programs, the end results provided answers to more questions than were asked at the outset.

What triggered Latrobe's experimentation was an attempt to lick problems connected with the form relieving of gear hobs. Some cutting tool manufacturers had been specifying tool blanks in the semi-hard forged state in an effort to prevent tearing while machining and to get a better finish on the tool surface. Even when partially successful, this added up to a costly machining operation.

When they tried making gear hobs from the new high speed steel having the sulphide additives a great improvement was noted in machinability characteristics and surface finish.

Initially, users were concerned about possible effects of the sulphide additives on heat treatment, mechanical properties and—most important — life of the finished tools. Reports from the field have confirmed Latrobe's laboratory findings which had shown no change in heat treat requirements or mechanical properties. Additional reports from an independent testing laboratory showed that none of the properties

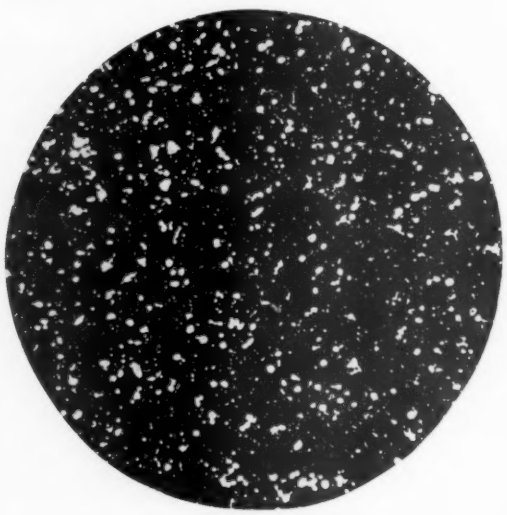


Fig. 1. A photomicrograph (500X magnification) of a portion of the longitudinal section of a hardened, polished and etched disc cut from a bar of "Desegatized" high speed tool steel of the M-2 type. The small, white spots are high alloy carbides. Their markedly uniform distribution results from the Latrobe "Desegatized" process of tool steel manufacture.

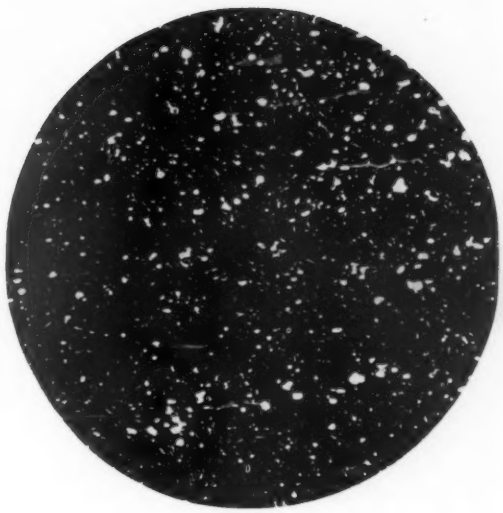


Fig. 2. This photomicrograph, also 500X magnification, is from a similar section of the new XL steel and shows the alloy sulphides; the light grey, elongated spots equally uniform in size, shape and distribution. The sulphides are introduced into the metal during the melting; it is the production control effected by the "Desegatized" process which insures the uniform dispersion of the sulphide additives. The "built in" sulphides do not affect chip formation but serve as an internal lubricant at the cutting edge without impairing the cutting edge strength of the tool. Hence, minimized built-up edge, increased tool life, and improved surface finishes.

of grain size, impact, cutting edge strength, transverse bend, tensile or ultimate strength was adversely affected by the sulphide additives.

Over and above these favorable factors, it was tool performance that was the pay-off. Not only did the hobs made from XL steel perform as well, but they outperformed tools of conventional high speed steel by a wide margin. Field and laboratory tests have borne out the Latrobe metallurgists' prediction that the prime advantage to be derived from the use of XL high speed steels was in better tool performance because of the "self-lubricating" action provided by the sulphides. As noted, machinability characteristics improved and machined surfaces were better, but the important gain was in ultimate tool life.

Comparable results in cutting tool manufacture and performance have been reported by makers of taps, form tools, thread chasers, knurling tools, rotary riles, twist drills and tool bits. This has led Latrobe to extend the development of sulphide additives to all of their high speed steels and high carbon-high chromium die steels.

—*E. W. P.*

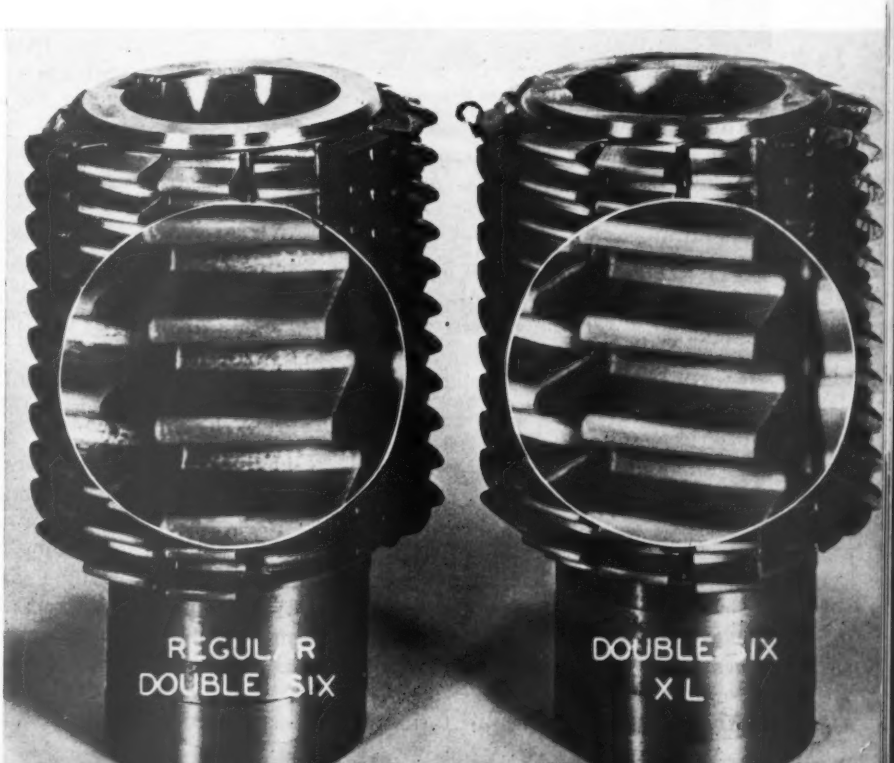


Fig. 3. (Left). A gear hob made from regular tool steel. The circular inset shows evidence of tearing and resultant poor surface finish left by the backing-off tool. This necessitates frequent sharpenings of the backing-off tool and a consequent shortening of its life. (Right) The same type of hob fabricated from the new XL steel containing sulphide additives. The inset photo shows the better surface finish due to the improved machinability which has resulted in greatly reduced toolmaking time.

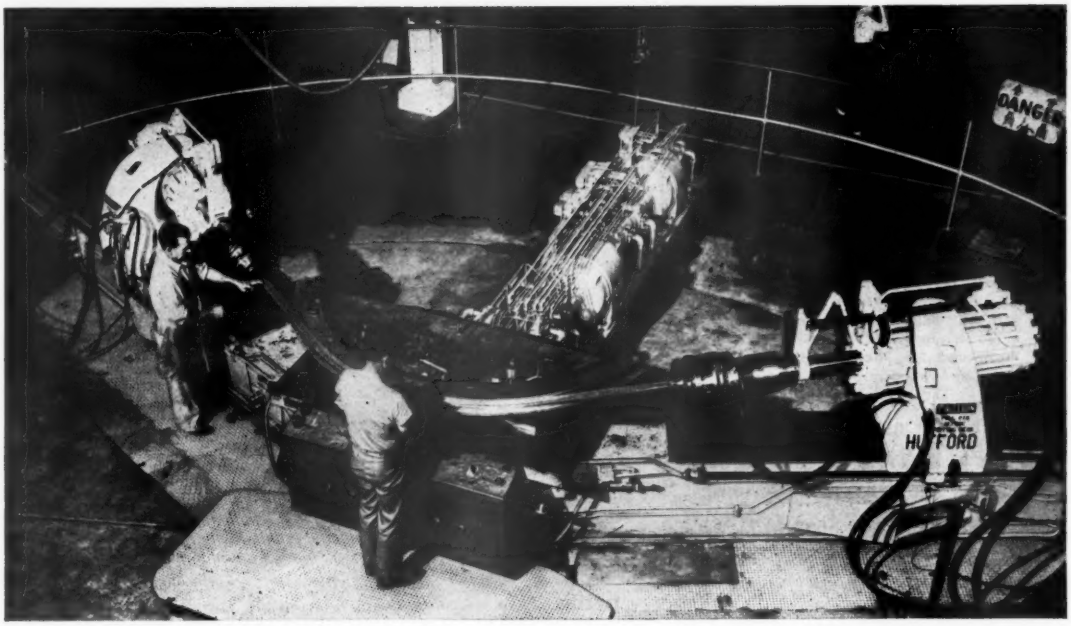


Fig. 1. An aluminum die is used on this stretch forming press to produce a channel former for the fuselage of a Convair Liner Model 340, at Consolidated Vultee's San Diego plant. This difficult forming job requires extra tooling to prevent the walls of the channel from buckling. An articulated mandrel, composed of small aluminum blocks strung on a wire cable, is placed inside the channel is support the walls during forming operations.

CAST ALUMINUM PLATE

. . . a Versatile Tooling Material

by Kirby F. Thornton

Chief Engineer
Development Division
ALUMINUM COMPANY OF AMERICA
New Kensington, Pennsylvania

A TOOLING MATERIAL that has found widespread acceptance in the aircraft industry, where its use has been perfected, is now receiving the attention of Industry in general.

The material is a cast tool and jig plate made of the light metal, aluminum. Stretch-forming dies, rubber pad process form-blocks, assembly jigs, locating devices, drill jigs and inspection fixtures are some of the applications where this relatively new tooling material finds growing usage. A look at what the aircraft industry is doing will suggest corresponding applications in other industries.

Probably the largest applications of aluminum tool and jig plate will be in inspection and assembly jigs and fixtures. In these cases, cast aluminum plate's light weight plus high dimensional stability and ease of fabrication are especially valuable.

Probably the most interesting use of cast aluminum plate has been as a forming die material. Douglas Aircraft, for example, now makes most of its rubber pad process form-blocks, as well as many stretch forming dies, from aluminum plate.

Aluminum in the case of forming dies has often replaced steel, pressed-wood, plywood and Kirksite alloy tooling materials. The new material offers extreme ease of machining, good strength, and excellent dimensional stability. Die life has usually exceeded the number of aircraft parts produced, and at the very least equals the life and cost of pressed-wood or Kirksite dies.

While cast aluminum plate can be used for tooling to form other metals, it holds the most promise for the forming of aluminum. As aluminum has become more readily available, an increasing number of parts designed in sheet aluminum and extruded aluminum shapes are being fabricated in the average metalworking shop. This has increased interest in low cost die materials such as cast aluminum plate.

In designing tools that employ aluminum plate, the various listed physical properties must be kept in mind. These properties reflect

the slight reduction that results from stress relieving, which assures dimensional stability for machining. Typical ultimate strength is 18,000 psi.

Cast aluminum is presently available in a plate size 48″ x 96″ or length increments of ½″. Standard thicknesses are numerous, ranging from ⅜″ to 4″. Thickness tolerances on cast plate can be held to ± .010″, so that two faces can be held to a high degree of parallelism. The degree of flatness actually obtained is highly satisfactory even for the most exacting tooling requirements. Surface finish ranges between 30 and 60 micro-inches (40 micro-inches is typical).

Cast aluminum plate has been found generally superior to currently available rolled plate, because of closer thickness and flatness tolerances and freedom from machining distortion.

Fabricating Aluminum Plate Tooling

Fabricating tools is fast and comparatively simple. The cast aluminum is extremely easy to machine. Even though milling is a fast operation, most aluminum dies can be fabricated by cutting to shape on a band saw followed by grinding and filing.

Building up a form block from several thicknesses of tool and jig plate is often better than machining the required contour from a single solid piece.

To facilitate cutting the tool shape, some of the aircraft shops coat the plate with a special light-sensitive emulsion. The drawing for the tool is then photographically developed on the plate. The machinist uses this drawing to cut the desired shape.

Stretch Forming Dies

As stretch forming has grown as a method for shaping of aluminum parts, aluminum plate has in turn developed as the outstanding die material for many of these parts.

Aluminum stretch forming dies have a broad range of use, although there are limits. Tools for parts such as the segments of an aircraft engine cowl would not normally be made of aluminum tool and jig plate. Neither would other parts which are suited for production on a drop hammer, for the forming on most drop hammer parts is quite deep, and reverse curves are involved. Aluminum plate could probably do the job, but such a big piece would be required that it is easier to cast the required die out of Kirksite alloy.

Some of the stretch forming operations using aluminum tooling are illustrated in Figures 1, 2, and 3. At Douglas Aircraft, most of these jobs have been engineered on Hufford A5 and A10 Stretch Presses. They are generally restricted to shaping aluminum extrusions, or sheet and plate sections that have a large length-to-width ratio, such as the nose hat section being stretch formed in Figure 3. In this case, three separate sections of tool and jig plate make a composite die with the face surfaces stepped to match the extrusion being formed.

Fabricating this type of stretch-forming die involves cutting the sections of the die on a Do-All band saw, followed by grinding and filing to the finish outline. Bolt and dowel holes are then drilled and reamed to make it possible to hold the die plates together. Figure 4 illustrates the methods developed at Douglas Aircraft.

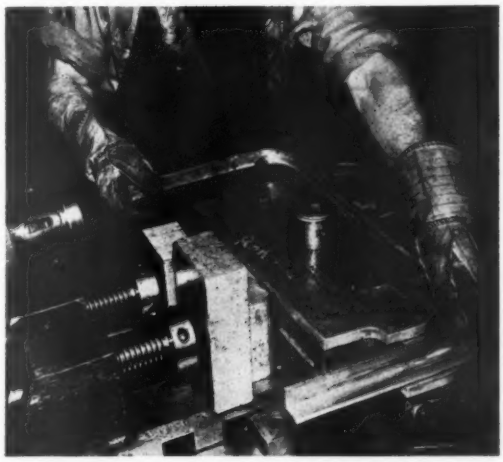


Fig. 2. An extruded angle formed on a Hufford press at Douglas Aircraft Company, using a die fabricated from Alcoa aluminum tool and jig plate.

Fig. 3. A nose hat section being stretch-formed around a cast aluminum plate die at Douglas Aircraft.

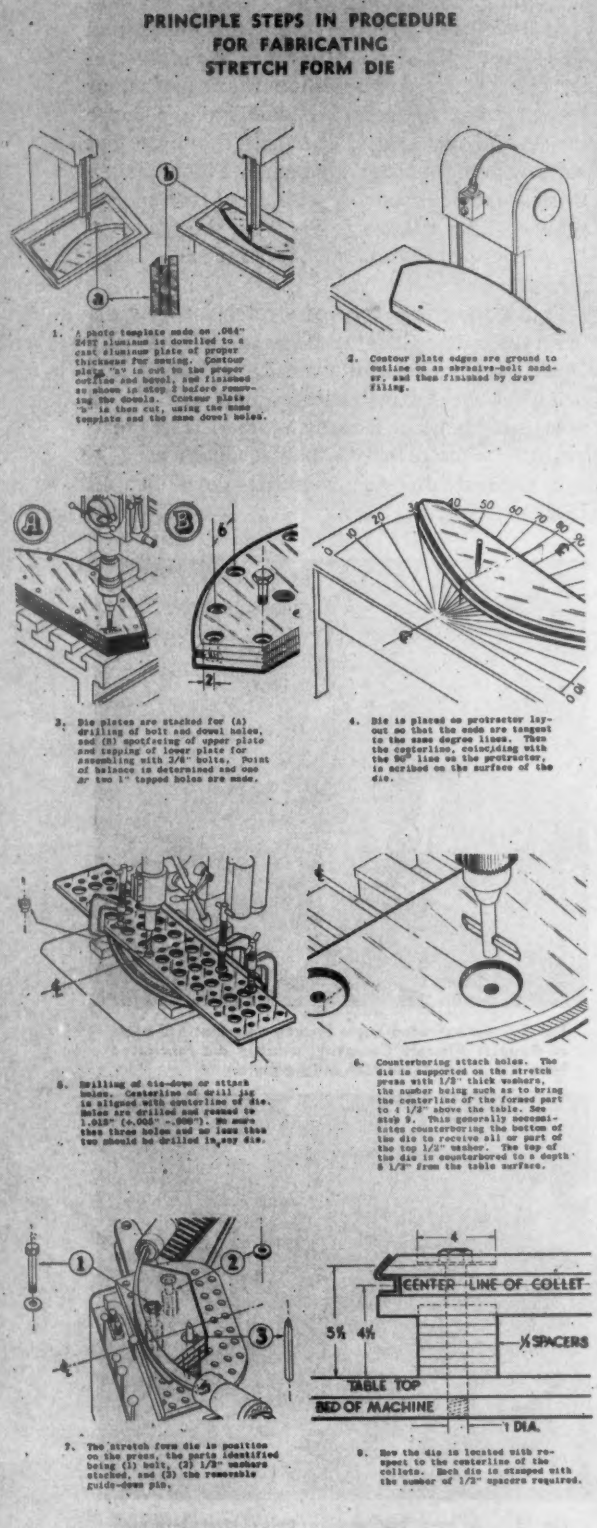

PRINCIPLE STEPS IN PROCEDURE
FOR FABRICATING
STRETCH FORM DIE
1. A photo template made on .064" 24ST aluminum is doweled to a cast aluminum plate of proper thickness for sawing. Contour plate "a" is cut to the proper outline and bevel, and finished as shown in step 2 before removing the dowels. Contour plate "b" is then cut, using the same template and the same dowel holes.
2. Contour plate edges are ground to outline on an abrasive-belt sander, and then finished by draw filing.
3. Die plates are stacked for (A) drilling of bolt and dowel holes, and (B) spotfacing of upper plate and tapping of lower plate for assembling with 3/8" bolts. Point of balance is determined and one or two 1" tapped holes are made.
4. Die is placed on protractor layout so that the ends are tangent to the same degree lines. Then the centerline, coinciding with the 90° line on the protractor, is scribed on the surface of the die.
5. Drilling of tie-down or attach holes. Centerline of drill jig is aligned with centerline of die. Holes are drilled and reamed to 1.0125" (+.000" -.000"). Be sure that three holes and no less than two should be drilled in any die.
6. Counterboring attach holes. The die is supported on the stretch press with 1/2" thick washers, the number being such as to bring the centerline of the formed part to 4 1/2" above the table. See step 9. This generally necessitates counterboring the bottom of the die to receive all or part of the top 1/2" washer. The top of the die is counterbored to a depth of 1/2" from the table surface.
7. The stretch form die in position on the press, the parts identified being (1) bolt, (2) 1/2" washers stacked, and (3) the removable tie-down pin.
8. How the die is located with respect to the centerline of the collets. Each die is stamped with the number of 1/2" spacers required.
CENTER LINE OF COLLET
SPACERS
TABLE TOP
BED OF MACHINE
DIA.

Fig. 4. Method of fabricating stretch form die, as developed by the El Segundo Division of Douglas Aircraft Co., Inc.

After the centerline of the die has been located, two or three holes are drilled and reamed to fasten the die to the press. These holes are counterbored to receive the spacer washers on the bottom of the die that locate it in position on the Hufford Press. (See Fig 5).

Aluminum dies have not been used extensively under the drop hammer or for stretching wide sheet parts. The main trouble is that the dies are of such a shape and size that it is simpler to cast them out of Kirksite or to build reinforced plaster stretch form blocks. Aluminum could probably be used for many types of drop hammer dies; however, Kirksite has been the standard material and works quite well in most instances.

Assembly Jigs

Cast aluminum plate has been extremely valuable for jigs and fixtures used in aircraft assembly work. Since such jigs will have the same coefficient of expansion as the aluminum parts being assembled, close tolerances can be held on assemblies of large dimensions.

An interesting example of the use of aluminum in assembly jigs can be seen in Figures 6 and 7. In these examples it serves as the "backbone" of the fixture.

Contour plates or boards for aircraft assembly jigs find extensive usage as illustrated in Figures 8 and 9. Since contour plates are sometimes removable, light weight is important. One-half inch aluminum plate is the most popular thickness for contour boards. Aluminum tube also shows promise as a component of some of these light weight tooling assemblies.

Inspection Fixtures

Ordinary jigs and fixtures for the dimensional inspection of parts and assemblies are often dimensionally unstable or heavy and hard to make. Aluminum plate has solved numerous problems in the design of these inspection devices.

Large fixtures such as that shown in Figure 10 are easily fabricated from aluminum tool and jig plate and usually can be handled by one man.

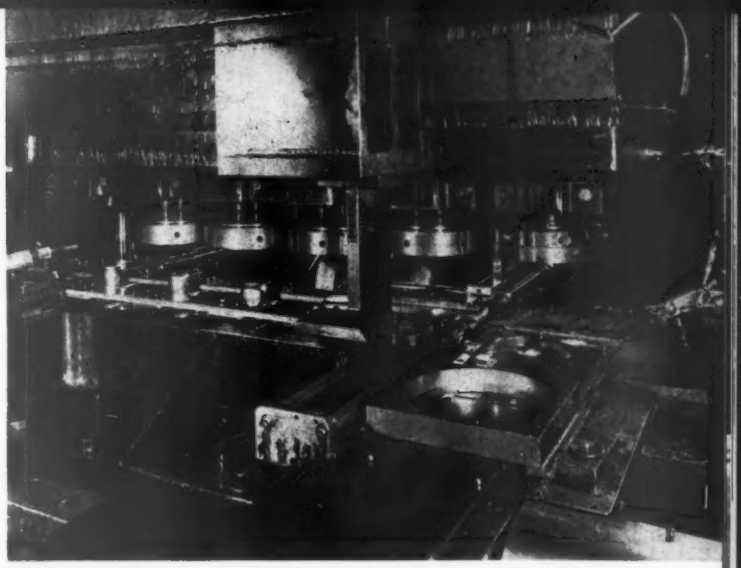
In running a dimensional check on smaller parts such as castings or forgings, fixtures made from aluminum are becoming popular, combining ease of fabrication with light weight. A number of dimensions can often be checked simultaneously with these fixtures, thus eliminating the need for several separate templates. An example of this type of fixture is shown in Figure 11.

. . . Continued on page 70

PRESSES PLUS DIES = STAMPINGS

◆ ◆ ◆

From plants across the country, these scenes selected at random typify the vital role that presses play in our ever-increasing national productivity.



Above, these punch and draw dies on an automatic transfer press produce muffler heads from 18-ga. zinc-galvanized, carbon sheet steel. Tooling required a steel providing (1) uniform through-hardening, (2) high wear resistance, and (3) safety and accuracy in heat treatment—die walls are only ¾" thick. Using Carpenter's No. 610 (Air-Wear) tool steel, this tooling is giving many months of dependable service, with production averaging 200,000 per month.

◆ ◆ ◆

Left, a first step in fabricating Republic Steel Kitchens is taken as cold-rolled sheet is fed into a press brake at Republic's Berger Mfg. Div'n. The notch, pierce, and cutoff die prepares base and side panels for kitchen units.

◆ ◆ ◆

Below, operator inspects circular aluminum blank cut from strip stock by a drop-through die on a double-crank, single-action press. The press is equipped with flattening rolls and feed rolls. Photo courtesy Aluminum Co. of America.

Below, on this big Minster press, oven top pieces for Perfection stoves are being flanged and embossed.

PRESS WORKING THE ALUMINUM ALLOYS

PART TWO OF TWO PARTS

METAL drawn in the form of a dome or hemisphere will tend to wrinkle; this being especially true where relatively thin gauge material is being formed. If this type of shape is to be produced in one draw, the ratio of the inside diameter to the original metal thickness should be kept below 200:1 to prevent the formation of wrinkles. If two draws are required to obtain the completed shell, the suggestions as given for the drawing of rectangular sections is applicable; the importance of having sufficient metal for hold down and radii to obtain a shell without fracture or objectionable wrinkling cannot be overemphasized.

by Lester F. Spencer
Metallurgical Consultant
Kensington, Connecticut

The use of the rubber forming process, where a thick rubber pad is used in place of a steel female die, is gaining wide acceptance as a forming operation. Thus, in a procedure known as "Marforming," a form block, which has a shape conforming to that required in the finished part, and a laminated rubber pad are the die elements. In actual operation, a predetermined blank size is subjected to a constant pressure created by the rubber pad which forces the blank to conform to the punch contour. Due to its relatively low tooling cost, rubber forming has its greatest field of application in the forming of limited quantities of various sizes and shapes. In many instances, due to the shape of the part to be formed, the elimination of wrinkles within the formed part is realized which, consequently, means the elimination of hand forming.

Other possible operations in regular press forming of the aluminum alloys are reverse drawing and ironing procedures. Ironing consists of reducing the wall thickness of the shell while maintaining a relatively heavy bottom; the amount of reduction in wall thickness being dependent upon the degree of hardness of the shell prior to actual ironing. With a ductile alloy, that is in the 0 temper, a reduction as high as 40 per cent can be realized in a single ironing operation. Permissible reductions will decrease as the ductility of the alloy decreases.

Reverse drawing is also used to some extent in deep drawing the aluminum alloys and, when found applicable, it permits excellent reductions from blank to complete drawn shell.

The press drawing of the aluminum alloys may encounter such objectionable conditions as wrinkling, buckling and fracturing. The Reynolds Metals Company, which has investigated the causes of these difficulties, has stated that wrinkling can be caused by too heavy a lubricant, insufficient blank holding pressure, excessive metal clearance and incorrect blank development. In regard to buckling, this condition may be attributed to too thin a material, excessive metal clearance, too large a die radius and insufficient control of metal during forming. In regard to fracturing of shell during the drawing operation, the following may be attributing factors: (a) poor lubrication; (b) excessive blank holder pressure; (c) tool radius too small; (d) radius of tools too small; (e) reduction too great; (f) insufficient metal clearance; (g) material too thin; (h) surface scratches and imperfections in the metal; (i) blank larger than die or blankholder; (j) punch and die not centered; and (k) drawing surfaces of tool bad.

A few comments on the various auxiliary operations which normally follow deep drawing operations can be made. In bulging operations, both mechanical and hydraulic procedures are employed. Mechanical bulging will use either the segmented metal die or a rubber punch. In the former method, the compressive action of the springs within the die will cause the segments to move out thus forming the bulge. A disadvantage of this method is the leaving of slight flat areas around the surface; these being objectionable where the part is to be buffed and polished. The use of a rubber

*Part One of this article appeared in the June, 1954 issue of TOOLING and PRODUCTION.

punch will eliminate this difficulty, but offers limited production in terms of punch life; a maximum of 3000 to 4000 pieces being realized before the punch has to be replaced.

Hydraulic bulging is quite suited for intricate shapes; however, correct volume and pressure, proper venting and the prevention of leakage are difficult to attain. In bulging the aluminum alloys, assuming the use of fully annealed stock, an increase in the circumference or diameter of 15 to 35 per cent can be realized depending upon the ductility of the alloy being formed.

Curling operations can be performed on a variety of equipment; the important factor in performing this operation on aluminum alloys is that any edge burr be on the inside of the curl. Where this burr is on the outside edge of the curl, the metal flow will be restricted and excessive wear on the curling tool will be experienced. The radius of curl should be a minimum of twice the metal thickness for the annealed aluminum alloys, however this value will usually increase as the ductility of the alloys decreases.

Operations such as beading, trimming and roll flanging are frequently performed on the aluminum alloys. The high production setup, illustrated in Figure 4, is a combination of trimming and beading of aluminum washing machine tubs. The beading rolls, as indicated at upper center, are forced against the work by a hydraulic cylinder. The trimming tool, located at the bottom edge, is also operated by a hydraulic cylinder. This same tub is flanged as shown in Figure 5 where the operator is

Courtesy, Reynolds Metals Co.

Fig. 4. High production setup for trimming and beading of aluminum washing machine tubs.

just removing a flanged tub from the machine. The cap, which is mounted on a bar and shown in the right foreground, is swung in against the work to hold it against a chuck which rotates the work.

Spinning of aluminum can be performed on shells that have been previously drawn to shape or on developed blanks which are spun progressively to the completed form. In the former instances, some types of shell designs, as exemplified by tapers, large radii or wide flanges, cannot be press drawn to completion without objectionable wrinkles, buckles or fracturing. This necessitates the combination of press draw and spinning in order to obtain the completed form. In the spinning from a blank, there is no limitation, other than width of material available, as to the size permissible for spinning. In some instances, width of blank used for spinning can be increased by welding two half sections to obtain the desired width or diameter of blank.

As in other types of metal working operations, the ductility of the specific alloy chosen will dictate the degree of deformation permissible before a regenerative anneal is required. Alloys 2S-0 and 3S-0 are considered to be best suited for spinning due to their low rate of work hardening; this fact often permitting considerable deformation. The alloys that are heat treated will usually work harden more rapidly; proper sequence of spinning operations along with intermediate anneals being necessary before arriving at the completed form. In many instances, where the part is to be heat treated. spinning can be performed almost to the com-

Courtesy, Reynolds Metals Co.

Fig. 5. Setup for flanging of the tubs shown being trimmed and beaded in Figure 4.

Table IV Blanking Tool Clearances (Ref. Reynolds Metals Company)

Shear Strength, psi	Die Size
Up to 10,000	Punch Size + 0.12t
10,000 to 12,000	Punch Size + 0.13t
12,000 to 15,000	Punch Size + 0.14t
15,000 to 18,000	Punch Size + 0.15t
18,000 to 24,000	Punch Size + 0.16t
24,000 to 30,000	Punch Size + 0.17t
30,000 and Up	Punch Size + 0.18t

pleted form, and after the part has been solution heat treated, a finish spin is applied to eliminate any distortion occurring during quenching. This finish spin should take place before excessive natural aging takes place.

Blanking, Piercing and Punching

These operations are within a group of operations in which a shearing action takes place; the stress is placed on the material in shear to the point of fracture. Factors such as the length of cutting edge, the thickness of the material, the shear strength of the material, clearance between punch and die, sharpness of cutting edges, etc. will determine the required pressure. In a blanking operation, the value for tool clearances will be from 0.12t to 0.18t depending upon the shear strength of the material; this value increasing to the higher limit as the shear strength increases. Thus, as is indicated in Table IV, a material having an approximate shear strength of 35,000 psi and a thickness of 0.050 inches, the clearance will be 0.009 inches.

Table V 180 Degree Cold Bending (Ref. Reynolds Metals Company)

Temper	Thickness	Alloy
0	0.016"	ABCDEFGH
	0.032"	ABCDEFGH
	0.064"	ABCDEF
	0.125"	ABCD
	0.1875"	ABC
	0.250"	ABC
H12 and H32	0.016"	ABCDE
	0.032"	ABCD
	0 064"	ABC
	0.125"	ABC
	0.1875"	AB
	0.250"	AB
H14 and H34	0.016"	ABCD
	0.032"	ABC
	0.064"	ABC
	0.125"	AB
	0.1875"	A
	0.250"	A
H16 and H36	0.016"	A

Note: Data on 180 degree bend on itself; thicknesses not tabulated have equal workability if within the maximum limits indicated.

Key to Symbols — A - 2S B - 3S C - C50S D - 52S E - 4S F - 61S G - R301 H - 24S - Alclad 24S - Alclad 4S

A decrease in pressure can be realized by utilizing shear on either the die or punch; the value of shear being approximately equal to the thickness of the material. The location of shear, i.e., whether it be on either the die or punch, is dependent whether the operation is one of blanking or punching. In the former case, where the blank is to be kept flat, the shear is ground on the die. Where a punching operation is to be performed, this shear will be on the punch; thus assuring minimum distortion of the material. Regardless of the operation involving a shearing action, the importance of having a keen cutting edge on the face of both the punch and die cannot be over-emphasized; this being especially true as the thickness of the material increases. This precaution will serve to localize stress so that fracture of the material will occur more easily.

In regard to clearance values for such operations as hole punching, piercing and perforating, these values should be kept at a minimum; a suggested die size being the punch diameter plus 5 percent of the metal thickness. In addition, a die relief of not less than 0.75 degrees should be provided for a quick "get away" of the punchings. Smooth, sheared edges of small pierced holes can be obtained in a two stage operation. The first operation consists of prepiercing slightly undersize. This is then followed by "shaving" to the required size, using angle ground punches.

Attention should be given to stripping since, in many instances, excessive breakage of punches can be traced to faulty stripping methods. The procedures for stripping will vary, the more common methods including the use of stationary, spring or cam actuated strippers. The stationary strippers are usually attached to the die holder at a sufficient distance to permit free handling of stock, whereas, spring strippers are usually attached to the punch holder. In order to protect the high surface finish of aluminum, the stripper may be covered with cloth to prevent scratches; the adhesive usually employed to hold the cloth in position being shellac.

An interesting operation involving punching is illustrated in Figure 6. In this instance holes are being punched in both the bottom and sides of the large and small washing machine tubs previously illustrated; this being another se-

quence of operations in the production of these items. In this type of press tooling, one pair of tubs is punched with each down stroke of the press. As is indicated, the upper die carries protruding work heads with sloping cam surfaces which actuate punch slides to produce the holes in the sides of the tubs.

Bending Operations

Bending operations are performed on a variety of equipment including standard presses, draw benches, roll formers, press brakes, bar folders, etc. Regardless of the method that may be employed, consideration as to the working characteristics as to both the composition and structural condition of the alloy must be given. Thus, in a specific alloy type, the permissible bend will vary with the temper; the minimum inside radius on a 90 degree bend increasing as the temper of the material increases. To assist in obtaining satisfactory results, the information in both Tables V and VI has been included.

Courtesy Reynolds Metals Co.

Fig 6. Punching of holes in bottom and sides of the two sizes of aluminum tubs.

. . . *Continued on page 128*

Table VI 90 Degree Cold Bending—Recommended Minimum Inside Radii (Ref. Reynolds Metals Company)

Temper	Thickness, Inches	No Radius	Recommended Radii ..... Inches												
			1/32	1/16	3/32	1/8	3/16	1/4	5/16	1/2	3/4	1	1 1/4	1 1/2	2
0	0.016	ABCDEFGHJ	...	...	...	...	...	...	...	...	...	...	...	...	...
	0.032	ABCDEFGHJ	...	...	...	...	...	...	...	...	...	...	...	...	...
	0.064	ABCDEFGH	...	J	...	...	...	...	...	...	...	...	...	...	...
	0.125	ABCDEFGH	...	...	...	J	...	...	...	...	...	...	...	...	...
	0.1875	ABCD	...	EFGH	...	...	...	J	...	...	...	...	...	...	...
	0.250	ABCD	...	...	...	EFGH	...	...	...	J	...	...	...	...	...
H12 and H32	0.016	ABCDE	...	...	...	...	...	...	...	...	...	...	...	...	...
	0.032	ABCDE	...	...	...	...	...	...	...	...	...	...	...	...	...
	0.064	ABCD	...	E	...	...	...	...	...	...	...	...	...	...	...
	0.125	ABC	...	...	D	E	...	...	...	...	...	...	...	...	...
	0.1875	.....	...	...	ABC	...	D	E	...	...	...	...	...	...	...
	0.250	.....	...	...	...	...	ABC	...	D	E	...	...	...	...	...
H14 and H34	0.016	ABCD	E	...	...	...	...	...	...	...	...	...	...	...	...
	0.032	ABCD	E	...	...	...	...	...	...	...	...	...	...	...	...
	0.064	ABC	...	D	E	...	...	...	...	...	...	...	...	...	...
	0.125	A	...	BC	...	D	E	...	...	...	...	...	...	...	...
	0.1875	.....	...	...	A	BC	...	D	E	...	...	...	...	...	...
	0.250	.....	...	...	...	...	A	BC	...	D	E	...	...	...	...
H16 and H36	0.016	ABC	DE	...	...	...	...	...	...	...	...	...	...	...	...
	0.032	A	BC	D	E	...	...	...	...	...	...	...	...	...	...
	0.064	.....	...	A	BC	D	E	...	...	...	...	...	...	...	...
	0.125	.....	...	...	...	A	BC	D	E	...	...	...	...	...	...
	0.1875	.....	...	...	...	...	...	A	BC	D	E	...	...	...	...
	0.250	.....	...	...	...	...	...	...	...	A	BC	D	E	...	...
H18 and H38	0.016	.....	ABCD	E	...	...	...	...	...	...	...	...	...	...	...
	0.032	.....	...	A	BCD	E	...	...	...	...	...	...	...	...	...
	0.064	.....	...	...	...	A	BCD	E	...	...	...	...	...	...	...
	0.125	.....	...	...	...	...	...	A	BCD	E	...	...	...	...	...
	0.1875	.....	...	...	...	...	...	...	...	A	BCD	E	...	...	...
	0.250	.....	...	...	...	...	...	...	...	...	...	A	BCD	E	...
61S-T4 and R301-T3	0.032	.....	...	F	G	...	...	...	...	...	...	...	...	...	...
	0.064	.....	...	...	...	F	G	...	...	...	...	...	...	...	...
	0.125	.....	...	...	...	...	...	F	G	...	...	...	...	...	...
	0.1875	.....	...	...	...	...	...	...	...	F	G	...	...	...	...
	0.250	.....	...	...	...	...	...	...	...	...	...	F	G	...	...
61S-T6, R301-T6, 24S-T3, 75S-T6, Alclad 24S-T3, Alclad 75S-T6	0.032	.....	...	F	...	H	GJ	...	...	...	...	...	...	...	...
	0.064	.....	...	...	...	F	...	H	GJ	...	...	...	...	...	...
	0.125	.....	...	...	...	...	...	F	...	H	GJ	...	...	...	...
	0.1875	.....	...	...	...	...	...	...	...	F	...	H	GJ	...	...
	0.250	.....	...	...	...	...	...	...	...	...	...	F	...	H	GJ

NOTE—For thicknesses not shown, use the radii listed for the next heavier gauge.

Key to Symbols A—2S B—3S C—C50S D—52S E—4S, Alclad 4S F—61S G—R301 H—24S- Alclad 24S J—75S, Alclad 75S

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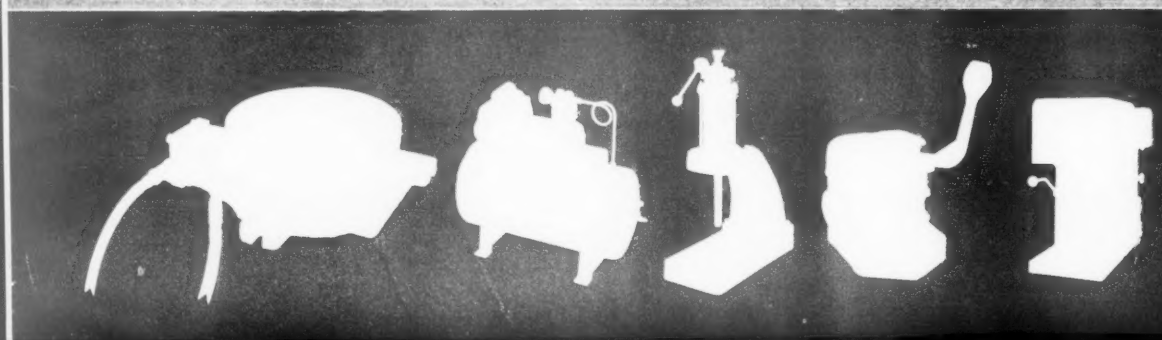
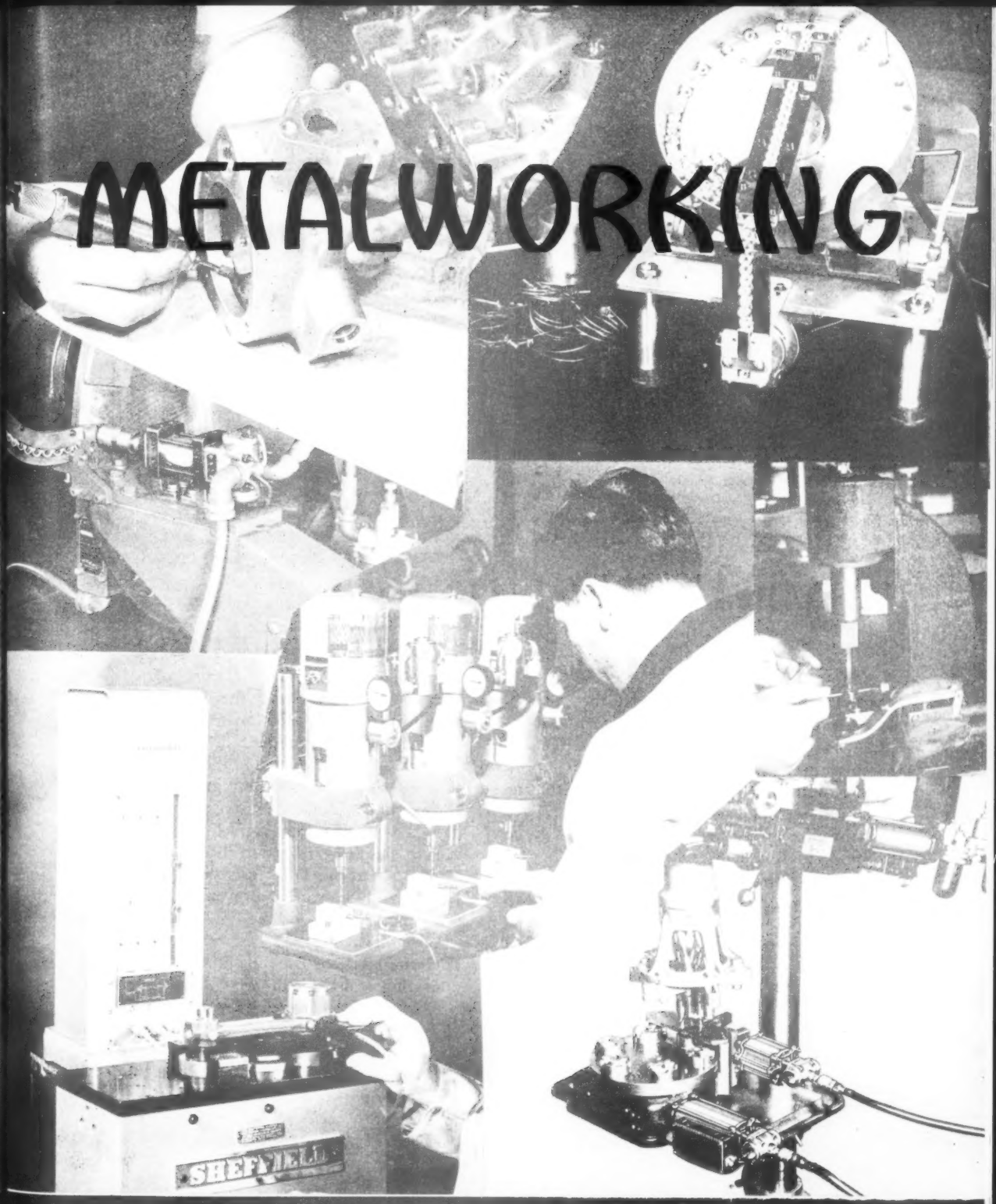
E. Willard Pennington

editor



METALWORKING



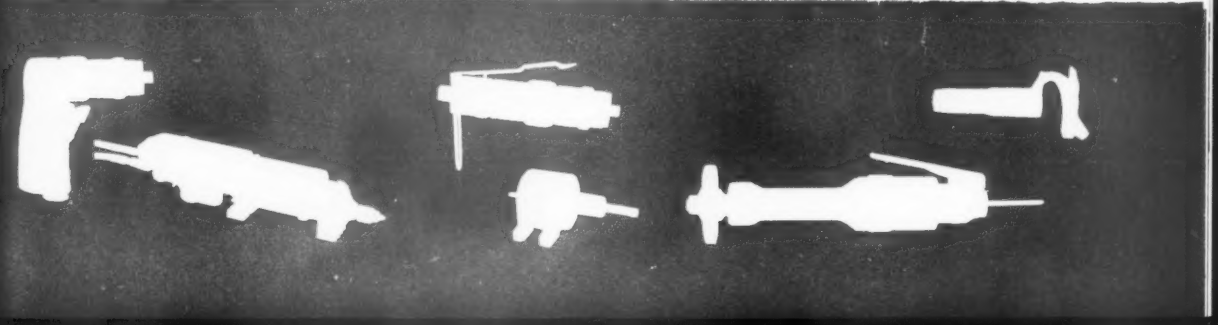


Photo courtesy Ingersoll Rand Company

Fig. 1. A horizontal portable grinder being used in cleaning a large pinion gear.

Air Power FOR METALWORKING . . . I

by Lester F. Spencer
Metallurgical Consultant
Kensington, Conn.

AIR POWER UNLIMITED

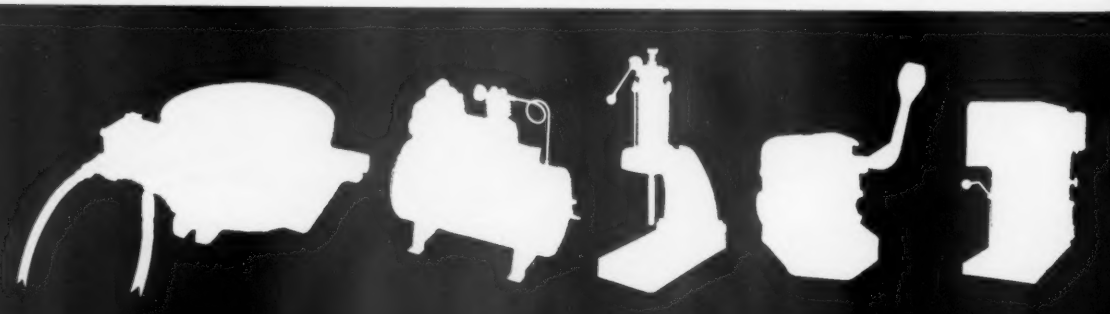
Serves Broad Industrial Field

IT HAS BEEN stated that the nation's capacity to produce is primarily dependent upon the following three factors, namely, (a) the natural resources of the nation; (b) the human energy available; and, (c) the tools employed to produce a product. In regard to natural resources, very little thought is given to air. This material, which is a mechanical mixture of gases containing by volume about 78% nitrogen, 21% oxygen and 1% argon, can be considered as a natural resource which, when compressed, has an almost unlimited potential to produce work; a potential which is limited only by man's ingenuity in application. Thus, the versatility, reliability, abundance and economy of this natural resource has resulted in an ever increasing usage of compressed air as a power source; and, in many instances, its usage has resulted in labor savings within the production field.

Compressed air is used in practically every industry—on both basic production of raw materials, and fabrication. In heavy industries compressed air is used in huge forging hammers and other equipment, originally designed for steam operation, due to the economy of air realized in both operation and maintenance. Die casting equipment, where such non-ferrous metals as aluminum, magnesium, and zinc are cast to shape by injection into a metal die, is also operated by compressed air.

In the metal working or fabricating industries, the applications of compressed air are innumerable. Of all the applications, one that is outstanding is the use of compressed air for air operating tools; this broad field influencing the production capacities of a large number of fabricating industries. Thus, such tools offer the ability to operate at long periods of time without interruption and, in comparison to electrical operated tools, at a comparatively low maintenance cost.

Some of the more common applications where compressed air is used to advantage



within industry would include, (a) its use as a method of positioning and clamping a structure for an operational procedure such as welding, this being exemplified in the automotive industry ([1]) where an entire automotive body frame is placed in a jig, clamped into place and welded; (b) its use in power chucks on lathes, milling machines and other machine tools; (c) the use of air jets to keep machine tools clean; (d) as a means of testing for flaws as exemplified in the testing of resistance welded joints, the sub-assembly being subjected to a pressure on the inside of the part and then submerged in water; ([3]) in bending presses, air lifts and jacks, spray painting, sand blasting, metal stamping, embossing and planishing.

Industrial Air Tools

Compressed air is widely used for driving rotating air motors; these air motors being commercially available in sizes from 1/10 hp up to 50 hp and in speeds from 20 rpm up to 75,000 rpm. In application, compressed air is very similar to electricity in that it is used as a medium for transmitting power from a prime mover to a remote location where rotary energy is required.

With a compressed air system, the generation of the prime power supply is realized through an air compressor rather than by an electric generator; the power travel to the location of the work application is realized through the use of pipe or flexible hose rather than wire; and, at the point of application, where prime power is transferred to work energy, a piston or rotary vane type air motor is used as compared to the standard electric motor. The advantages of air operated tools are generally recognized; the advantages of rotory air motors being based on the following, as given by the Compressed Air and Gas Institute.

(a) an air motor is considerably lighter in weight and smaller in bulk than a comparable electric motor.

(b) the speed, torque and direction of rotation of an air motor can be readily controlled and adjusted to the job requirements.

(c) air motors have no tendency to become hot when overloaded. They will withstand repeated or prolonged stalling as well as repeated and rapid reversal without injury or overheating. They can be accelerated rapidly because of the high rate at which the energy of compressed air can be released.

(d) an air motor is inherently explosion proof as it presents no spark hazard in an explosive atmosphere.

Photo courtesy Chicago Pneumatic Tool Co.

Fig. 2. Dressing down a weld with a vertical portable grinder.

There is a large variety of industrial air tools; a convenient classification being as follows: (a) the abrasive tools such as the sanders, buffers and grinders; (b) drills, reamers, tappers and stud setters; (c) screw drivers, nut setters, wrenches and impact tools; (d) percussion tools such as chipping hammers, riveters, rammers, etc,; (e) compression and yoke riveters; (f) air hoists; and (g) pneumatic specialty tools.

The two basic designs for grinders would be the horizontal and vertical types as illustrated in Figures 1 and 2. A wide range of modifications have been incorporated so as to satisfy conditions of speed, size, weight and application. As to usage, equipment of this type is employed for such operations as grinding, sanding, buffing and wire brushing. Thus, as a grinding tool, it can be employed in the removal of excess weld deposit; in the cleaning of a

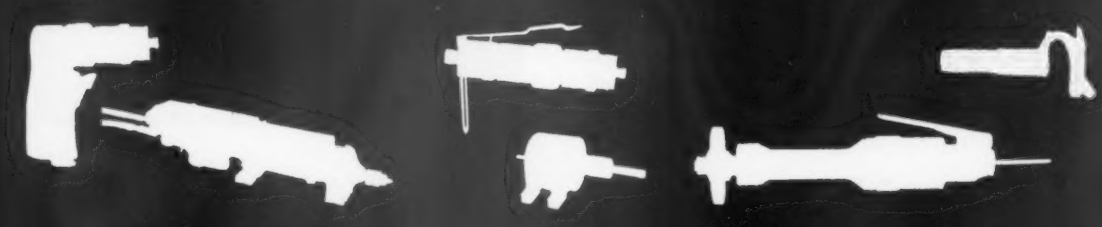


Photo courtesy Ingersoll Rand Company

Fig. 3. Air power screw drivers used in assembly line work. Screw drivers are suspended by spring to facilitate handling of the tool.

casting; in the removal of defects in either a casting or billet; and, in the toolroom in the grinding of metal dies. It is understandable that a variety of wheel sizes, shapes and compositions are available; the selection being in accordance with the material to be ground along with both the type of work and the amount of material to be removed.

Throughout industry "Air Drills", which are available in a wide range of sizes, are used for operations such as reaming, tapping, nut running, drilling, etc. The general types of equipment available being designated as reversible, non-reversible, wood borer and the close quarter drill.

Pneumatically operated "screw drivers" and "nut runners" are recognized as time savers in assembly line production; the four general types available being the direct drive, the impact, the disengaging clutch and the ratchet. The direct drive screw driver and nut runners are powered by either reversible or non-reversible air motors; this tool type being usually limited to nuts and screws of 1/2" diameter and smaller (1).

The impact type nut runners, which are usually reversible, can develop very high torque values with very little or no torque reaction to the operator. Its use has proven to be labor saving; one example (2) being of a large manufacturer of scales who assembled the platform yoke and tie bar on industrial scales by using a hand tool. The running down of sixteen 5/16" by 1-1/4" cap screws took one minute and 41 seconds. This same job with an impact type nut runner took but 33 seconds. In addition, the operator had less fatigue while the air tool paid for itself in 6 days. This type of tool is used for nuts that are 1/4" or larger.

The disengaging clutch type nut runner has either a reversible or non-reversible air motor; the nut or screw being turned (1) with a positive torque drive until the torque load is such that the clutch disengages the motor from the drive spindle. This type of design finds its greatest usage with nuts and screws of 3/8" diameter and smaller. When a confined space is involved in either tightening or removing nuts, the ratchet type nut runner is usually employed; their use being for nuts that are 1/2" in diameter or smaller.

Chipping and scaling hammers are percussion tools used in the removal of surface cracks, slag inclusions and other defects that may appear on either a casting or a steel billet. Where the hammer is equipped with a scaling chisel, it can also be used in the removal of old paint, rust and scale from metal surfaces prior to refinishing.

Riveting hammers, which are of varied designs and capacities, can be conveniently divided into the percussion (hammer blow) and the compression (squeezing) types; the latter method is often the perferred since it gives a stronger and more uniform joint, (1) but is restricted in application by weight of equip-

Fig. 4. A squeeze type portable riveter with an alligator jaw shaped yoke shown in operation.

Photo courtesy Chicago Pneumatic Tool Co.

ment and dimension of work piece. Compression riveters, as illustrated in Figures 4 and 5, deliver a squeezing action obtained from a simple air piston and cylinder coupled to a cam, toggle or wedge which multiplies the force as much as 10 times

Percussion riveters upset or form the rivet material by an impact blow; the intensity and rapidity of blow being dependent upon the capacity rating of the equipment. Lightweight riveters, which may weigh as high as 9 pounds, have capacities to drive soft iron, dural or aluminum rivets cold up to 1/2" in diameter. In addition, they may be employed for light chipping, scaling and calking when equipped with the proper chisel. In many designs, especially with the lightweight riveters that weigh up to about 9 pounds, a yoke is usually incorporated within the design so that the tool does its own "bucking up" and, therefore, one operator is all that is required to use the tool. The medium and larger riveters are employed for general structural work, boilers, large steel vessels, etc., where the required rivet size, which may be up to 1-1/4" in diameter, is beyond the capacity of the lighter equipment.

Air hoists, which may be conveniently divided into air cylinder and air motor types, are employed extensively in all types of manufacturing. Due to the limitations of the air cylinder type hoist, the air motor hoists are more frequently employed. The use of compressed air for this application is ideal since not only must it satisfy the need of lifting and transporting a load, but also, must satisfy such conditions as (a) a wide range of speed control; (b) minimum danger of overheating during operation; and, (c) efficient operation under all types of atmospheres including acid fumes, explosive gases, dust, water and steam.

Air Cylinders

Linear actuators, which include a wide variety of air cylinders and positioners, are one of the more important power producing devices. Thus, pneumatic operation of jigs, fixtures, chucks, work-holding devices and the various designs of "feed devices" have proven economically sound in that not only does it assure increased productivity of the individual worker, but also, contributes to safer and less fatiguing operations. With the application of air cylinders in industrial production, many industries have found it best to standardize on a series of air cylinders; this may cover a wide range of clamping pressure and piston travel.

Photo courtesy Chicago Pneumatic Tool Co.

Fig. 5. Stationary compression riveter used in the aircraft industry. Units of this type develop up to 20 tons force.

As the need for linear actuating devices arise, the jig, fixture or work-holding device, whatever may be employed, is designed to accommodate the standard cylinder.

Air cylinder design is rather simple; the unit consisting essentially of a moving piston mounted on a rod which moves in a linear direction within the cylinder while under the influence of compressed air. Cylinder diameters vary from less than one inch to several feet; the pressure delivered at the end of a stroke being from a few pounds to several tons. Piston strokes are almost any reasonable length; cylinders with strokes of 15 feet or more are not uncommon. The air cylinder design, which may be either of the (a) single acting, spring return; (b) double acting; or (c) double acting, through rod, is an ideal source of power for positioning and clamping, tool feeds, pushing or pulling operations such as straightening and bending metal, ejecting work from machines, raising and lowering, and other reciprocating machine motions.

Air feed devices are pneumatic systems in which an air cylinder serves as the actuating element; these devices proving exceptionally useful in mass production work. Where but a single movement is involved, such as the motion of a tool, the air feed device may be relatively simple; the air cylinder usually being connected directly to the element to be actuated. The only problem which arises here involves that of pressure; low to medium pressure requirements can be successfully met by the use of the air cylinder, however, in application that may require comparatively higher pressures, the air cylinder can be used in conjunction with an oil cylinder. In this latter in-

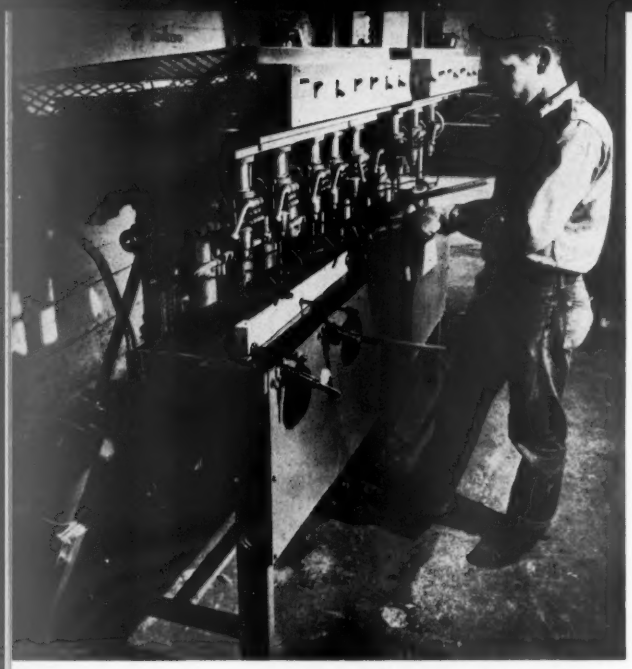


Photo courtesy Compressed Air and Gas Institute

Fig. 6. An air cylinder supplies the drive for up to 14 drills on this handle drilling operation.

stance, the air cylinder boosts the pressure of the oil cylinder and keeps an even stroke throughout.

When it is necessary to retard the stroke of a piston, cushioned cylinders are usually employed. When this cushioning action is required for either a major portion of a stroke or for the complete stroke, a speed control valve can be employed. As an alternative, a second cylinder can be employed; this cylinder being smaller in size to oppose the action of the pressure cylinder.

Where one machine involves several operations, or, where several machines are involved, the air feed designs to produce the required automation may be rather complicated; the problem that usually arises is usually the method to employ in connecting the air cylinder to the machine. This is usually done by either the rack and pinion; the ratchet; the chain drive; and, by either electrical or hydraulic systems.

It is a recognized fact that the use of air cylinders or diaphragms to produce linear movement is both practical and economical; this being proven literally by the thousands of applications within industry. Thus, examples in the use of compressed air to obtain linear movement would include (a) the air cylinder feed on a drill press which provides a desired constant feed force with a varying speed of forward travel; (b) air operated doors; and, (c) air brake systems.

One example in the use of an air feed system in industrial production is that illustrated in Figure 6; this application representing the multiple drilling of holes in wooden handles. The multiple drill fixture was relatively simple to arrange, however, difficulty had been encountered in the type of automatic feed. This problem was solved by using an air cylinder acting on a rack and pinion. In actual operation, the hardwood handle is placed in a fixture with the operator actuating the air cylinder with a foot pedal. This turns a chain drive at each drill; the feed speed being regulated by changing either the air volume or pressure. This permits the operation of fourteen drills; all operating simultaneously and almost instantly. Thus, nine drills operate at the top of the handle; four underneath and one at the back.

Another example in the use of an air cylinder as an actuating element is illustrated in Figure 7. In this instance, as the hopper (A) rotates, it feeds the parts to the track (B), after which they are gravity fed to a special indexing fixture; this feed being equipped with a continuous cycling control. A touch of the handle starts the initial operation. As the spindle advances, it actuates, through mechanical linkage, the air motor which clamps the part. As the spindle retracts, the air motor releases the part and indexes the fixture.

Other Uses of Compressed Air

Compressed air can be used to advantage by automatically controlling rate of feed flows, steam pressures, vessel pressures, liquid levels, heat treating temperatures and many other variables encountered in production processes. Basically ([2]), an instrument control would consist of two elements. One is the pilot instrument itself which is responsive to the variable whether it be a change in pressure, temperature, etc. This acts as a pilot to manipulate the second element which is an air actuated diaphragm valve. Variations in air pressure from the pilot will re-position the valve to effect the desired control.

Blast Cleaning, which employs compressed air to impart a velocity to the abrasive medium, is used effectively to remove foreign surface contamination such as rust, scale, old paint, etc.; for the cleaning and finishing of sand and permanent mold castings; and, in the preparation of metal surfaces for subsequent painting, galvanizing, etc. The process is often referred to as "sand blasting", however many abrasive materials of various grit sizes would

include steel and iron shot, silicon carbide, manufactured alumina, etc. Shot peening, which also belongs to this category, is widely used to increase the fatigue value of the surface peened with the abrasive.

One of the most familiar uses of compressed air is the spraying of paint. In some types of spray guns compressed air traveling at high velocity through a venturi tube is used to create a vacuum. This vacuum draws or pumps liquid paint from a reservoir up to a mixing nozzle. The other method employed is on the principle of displacement. In this instance, air enters the top of a sealed container which contains the paint; this resulting in a displacement of the liquid paint from the tank through a hose and into the spray gun.

Compressed air is also used in the agitation of liquids. In this case, a perforated pipe runs into and at the bottom of the tank; the compressed air, which bubbles through the liquid with sufficient velocity to obtain agitation. This method of agitation can be used for acid solutions, solvents used for cleaning and in the agitation of quenching oils.

Air gaging is a relatively new application in the use of compressed air; this field of application constantly growing due to the improvements in design and accuracies in gaging. It is now used for checking numerous dimensional relationships such as concentricity or alignment between two diameters; squareness of bore to face; center distances between bores; etc. In many instances, several of these dimensional characteristics can be checked simultaneously.

Efficiency of Compressed Air System

As with any other industrial device, maximum efficiency in the use of compressed air should be realized; this efficiency being usually directly affected by the established system within the plant in supplying this raw material. Whether the compressed air will motivate a rotary air tool or an air cylinder, the factors that should be considered would include:

(a) It is recommended that a suitable intake filter at the compressor be provided so as to eliminate dirt and grit and thus keep to a minimum the wear normally expected on valves, pistons and cylinders.

(b) The choice of compressor would be based on such factors as desired capacity, pressure requirements, continuity of service, the load factor, etc.

(c) It is also recommended that an aftercooler be included so as to remove the moisture in the incoming air. Removal of all moisture can be assured by the use of automatic traps within the system. It may be necessary to install a receiver so as to absorb the pulsations from the compressor.

(d) Check frequently to determine whether proper operating pressure is at the tool. A drop in pressure, which seriously affects the efficiency of the tool, may be caused by air leakage within the system, excessive length of pipe or hose; wrong type of connection; and, incorrect diameter of pipe or hose.

(e) Select the proper tool for the job.

(f) Establish an adequate maintenance system.

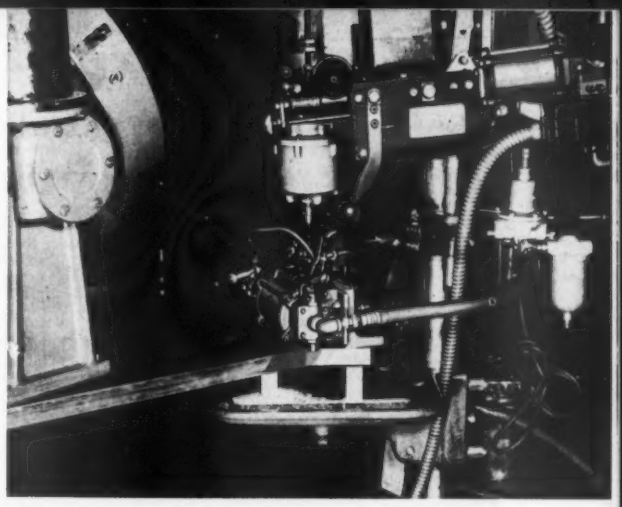


Fig. 7. This tooling setup shows an air cylinder (C) as the actuating element. As the hopper (A) rotates, it feeds the parts to the track (B), after which they are gravity fed to a special indexing fixture which is equipped with a continuous cycling control.

In the use of rotary air tools, hose couplings, fittings and various hose arrangements have a definite effect on the actual performance of the tool. Thus, where simple precautions are not taken, substantial power losses will occur between compressor and tool. A large share of these losses is apt to result from the use of improper hose and fittings, but they can be virtually eliminated at small expense by changing hose hook-ups. Hose couplings, nipples and menders that are not suitable restrict the air flow and reduce the working pressure at the tool. Loss of pressure means less work done.

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Air Power FOR METALWORKING . . . II

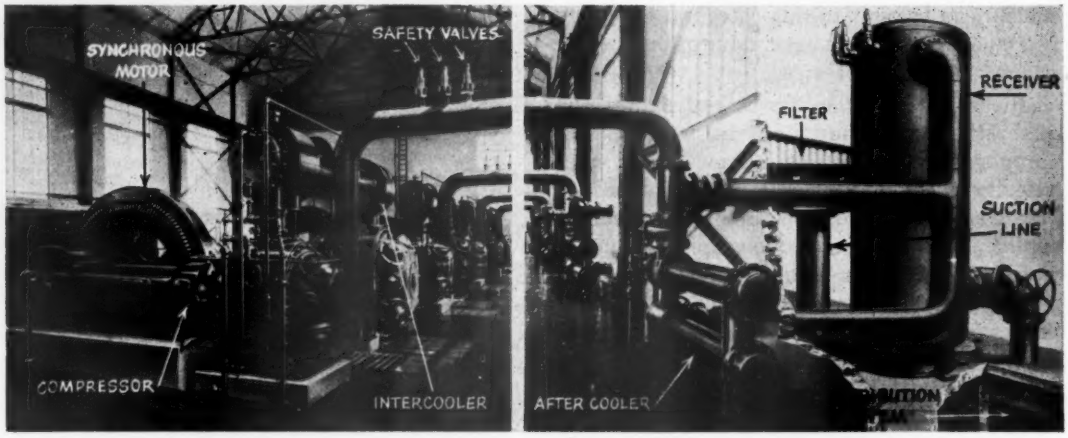

Fig. 1. Composite illustration showing a large complete compressed air plant including compressor, synchronous motor, intercooler, safety valves, aftercooler, filter, receiver, suction line and connection to distribution system.

ENGINEERING THE COMPRESSOR INSTALLATION FOR MAXIMUM EFFICIENCY

by Carl F. Benner
Associate Editor

PLANNING, SELECTING and Installing the Compressed Air Plant. Compressed air is a major industrial power, possessing many advantages. It is safe; it is flexible in its application; it is easily transmitted.

Compressed air is labor-saving power. The total cost of doing a given job by air includes labor, burden, amortized cost of the tool with its repair and maintenance, and cost of the compressed air. It has been demonstrated many times that the cost of labor plus burden is more than 95 per cent of the total cost of the operation; therefore, the cost of the compressed air and the tool itself is insignificant when compared with the value of the work it performs.

In order to obtain the benefits and the advantages of compressed air, planning is essential. To achieve the savings and results expected, care must be exercised in the selection of the equipment, in its installation, and in laying out the distribution system. The following will suggest important questions to consider in planning the compressed air plant.

A compressed air plant (Figures 1 and 2) consists of one or more compressors, each with the necessary driver, control or regulation, intake air filter, aftercooler, air receiver, and interconnecting piping, together with a distribution system to carry the air to points of use.

The object of installing a compressed air plant is to provide sufficient quantity of air to the work at sufficient pressure for efficient operation.

Before attempting to determine the amount

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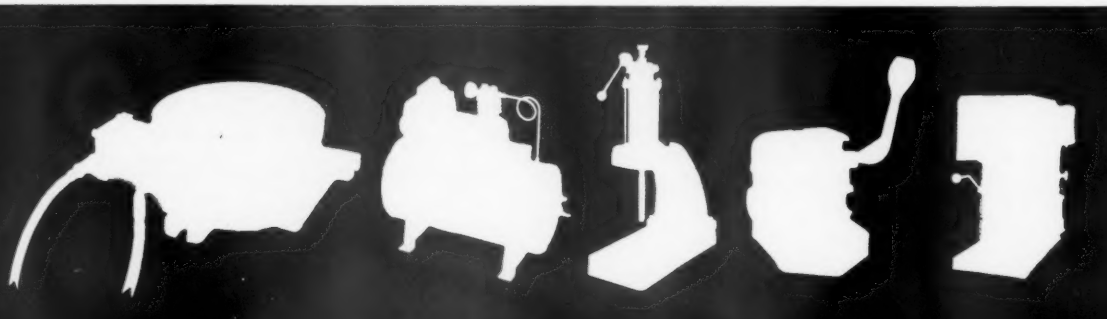


of compressed air necessary, a thorough study should be made to provide for the use of air power in all applications for which it is suitable.

The information obtained from the study will then become basic in approaching the problem of engineering the compressed air installation in any particular plant. In working out an installation, a series of analyses is recommended. These include:

1. Necessary compressor capacity
2. Number of compressor units
3. Location of compressor units
4. Regulation of compressed air plant
5. Compressed air distribution system

1. Necessary Compressor Capacity

The proper capacity to install is, of course, a vital question, requiring careful analysis. A study of air-operated devices in a typical plant will show that many of these devices operate almost continuously but there are others which operate infrequently but require a relatively large air supply when in use. It will also be discovered that the actual amount of air used by the individual device will vary considerably in different applications.

The first suggestion is, therefore, that the average air consumption of air-operated tools be ascertained. This may be obtained from manufacturers' literature or may be closely approximated by actual test.

Relatively few air-powered devices use air continuously. Pneumatic tools operate intermittently and their net air consumption is considerably less than their maximum. The ratio of actual air consumption to the maximum continuous full load air consumption is known as "Load Factor."

Two items are involved in this term "Load Factor." The first is the "Time Factor" or percentage of total time that the device actually uses air. Obviously, if a number of devices are operated from a compressor plant, and none of them operate all the time, it is reasonable to assume, and experience will bear this out, that the maximum air used in cubic feet per minute is much less than the total which would be required if they were all operating at the same instant at full load.

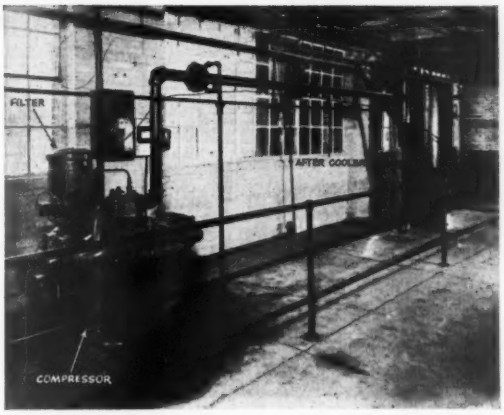


Fig. 2. Small two-stage air-cooled compressor complete with driver, filter, pipe-line type aftercooler and receiver.

The second item in the term "Load Factor" will depend on what might be called the "Work Factor," or the per cent of maximum possible work output per minute which is actually done by the device. For example, the air consumption of a grinder with full open throttle varies considerably, depending upon how hard the operator pushes it against the work.

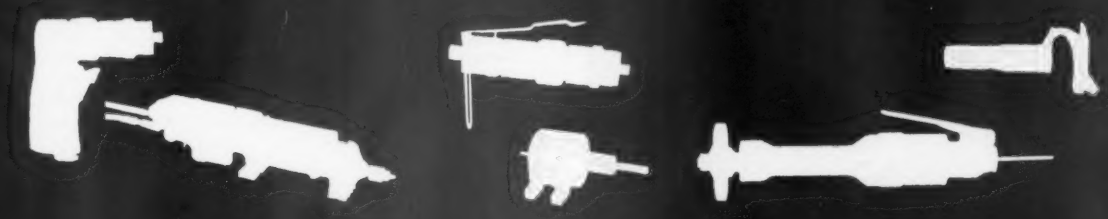
"Load Factor" is actually the product of "Time Factor" and "Work Factor."

In one shop studied, for 34 separate portable tools on production work, the actual air consumed was only 15 per cent of the supposed full-time rated air requirements.

In determining Load Factor, care should be taken to eliminate the tools on hand in the store-room or not in use.

The above remarks apply to the more steadily operated air tools and appliances. A study of the uses of air power which cause heavy but usually short-time demands will develop added capacity required for these operations. The possibility of storing air in large receivers should be considered although this can be helpful only to provide for peak demands of very short duration.

Some comment should be made on the practice of adding a percentage to calculated compressor capacity to provide for piping leakage. This has been due largely to the fact that compressed air is so harmless that it is not considered vitally necessary for an air system to



be tight. Electrical lines must be carefully insulated—leaks cannot be tolerated. Steamlines are kept tight because of danger and also because steam leaks are objectionable.

There is no more justification for allowing compressed air wastage than there is in buying a compressor without capacity control, letting it operate continuously at full capacity and discharging the surplus through relief valves to the atmosphere.

Leaks in the valves and joints on a compressed air system waste a considerable amount of air. A number of leaks that seem small in themselves may total a tremendous volume of wasted air.

Table shows the dollar and cents value of this wastage:

Size of Opening, Inches	Cu. Ft. of Air wasted per month at 100 lbs. pressure, based on nozzle coefficient of .65	Cost of Air wasted per month based on 7 cents per 1,000 cu. ft.
3/8	6,671,890	$560.42
1/4	2,920,840	245.35
1/8	740,210	62.16
1/16	182,272	15.26
1/32	45,508	3.85

Often it is possible to determine the exact extent of the air losses in a plant by finding what portion of the compressor capacity is required to keep pressure in the air lines when no equipment is being operated.

Careful maintenance of air lines will more than pay for itself and may in some cases make unnecessary the replacement of the present compressor with one of larger capacity.

Before determining the final compressor capacity, consider carefully that once compressed air is available, its versatility will of itself lead to a magnitude of profitable uses and applications not originally anticipated. Although mechanically it is no problem to increase the size of a compressed air plant since any number of units can discharge into the same system, it is prudent to provide some excess capacity for growth when the plant size is originally considered, including piping system.

It is less difficult to arrive at the proper capacity needed for a plant extension than for a new installation. Local experience, compressor load factors, tool load factors, etc., either known or readily determined, provide a sound basis for decision.

The most frequent indication that more compressor capacity may be needed for an "overloaded" plant is low air pressure, which reduces shop production alarmingly. This is discussed later under the sub-head, "Low Air Pressure."

Based on a careful log of the pressures throughout the production areas, present compressor operating load factors and peaks in demand (periods of unusually low air pressure), it is possible to determine with reasonable accuracy the additional compressor capacity required to maintain full air pressure at the working positions and thus increase tool effectiveness and production to the maximum.

2. Number of Compressor Units

The number of units into which total capacity should be divided is important. Air compressors are sturdy machines but, like all mechanical and electrical equipment, they require maintenance and must occasionally be taken out of service. Compressed air supply during maintenance periods is provided for differently in almost every plant. If the supply of compressed air is vital to continued production, the answer is usually determined by a comparison of the cost of standby capacity with the value of the production loss. (Fig. 3).

Many plants require a relatively small volume of air continuously, even when the plant is not in production. A small unit of proper size to take care of such requirements over week-ends, holidays, etc., is often desirable

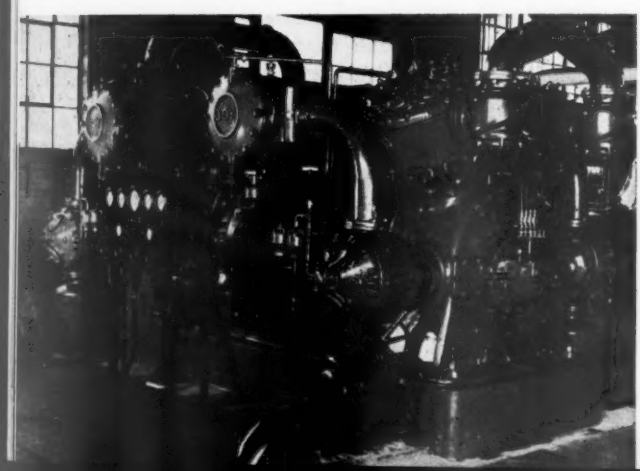


Fig. 3. Twin air compressor, the primary source of plant air for a large machinery manufacturer. The twin arrangement is particularly suitable for plants where air requirements vary greatly since the two compressor units, powered by a common motor, can be operated together or singly depending on demand.

Photo courtesy Joy Manufacturing Co.

3. Location of Compressor Units

The location of a compressed air plant with relation to the points of air use should be given some study. A central plant housing all the compressors involved has advantages in unified operation and care, better supervision, and probably less labor cost. In a central plant, it is probable that no more compressors will be kept operating than are necessary to maintain pressure. The load factor and operating efficiency of each unit will, therefore, tend to be relatively high.

It is possible, however, that a central plant cannot be so located that satisfactory distribution of air and maintenance of pressure may be obtained without excessive piping costs. In such a case, it may be better to divide the compressor plant, as shown in Figure 5, into two or more installations at or near specific load centers, interconnecting the plant piping so that air may be distributed either way to meet peak load requirements. Of course, the plant should be placed as close as possible to the larger load centers. This reduces piping costs and results in higher pressure at the tools with closer control of the pressure.

Where two or more compressors are installed in various parts of the plant, the equipment should not be placed in some obscure corner with no one to look after it. Such an installation will surely be neglected.

4. Regulation of Compressed Air Plant

Since the demand for compressed air usually varies widely from time to time, some form of capacity control is required. Two general methods are available. The first, known as speed and pressure regulation, varies the speed of the compressor according to the demand for air such as is usually done in a steam driven compressor. The second, known as constant speed regulation, operates the compressor at a constant speed and varies the capacity by any one of several types of unloading systems as is usually done in a motor-driven compressor.

For general industrial use, control of pressure closer than a 5 per cent range between full load and no load is unnecessary and should be avoided. Much closer regulation of the pressure can be provided where special conditions require it.

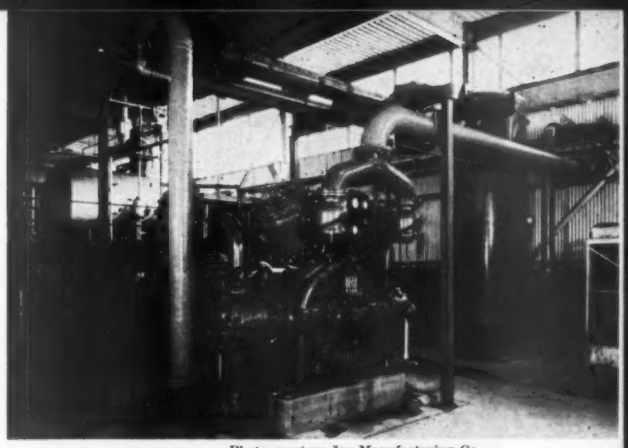


Photo courtesy Joy Manufacturing Co.

Fig. 4. This is a four cylinder, heavy-duty, two stage, double-acting type of semi-radial design. It is complete with aftercooler and air receiver. The installation is in a Western Pennsylvania Steel fabricator's plant.

Wherever possible, pressure regulators should be so selected and adjusted that large units will act as base load units and unload only after smaller units have been shut down. Of course, where the requirements have diminished to where one of the smaller units could handle same, the large unit should be shut down. In this way, the overall economy will be improved.

5. Compressed Air Distribution System

Any drop in pressure between the compressor and the point of use of the compressed air is irrecoverable loss. The distribution system is, therefore, one of the most important elements of the compressed air plant. In planning it, the following general rules should be observed.

A. Pipe sizes should be large enough so that the pressure drop between the receiver and the point of use will not exceed 10 per cent of the initial pressure. Provision should be made not only for present air capacity but also for reasonable future growth.

B. Where possible, use a loop system around the plant and within each shop and building. This gives a two-way distribution to the point where the air demand is greatest.

C. Long distribution lines should have liberal size receivers located near the far ends

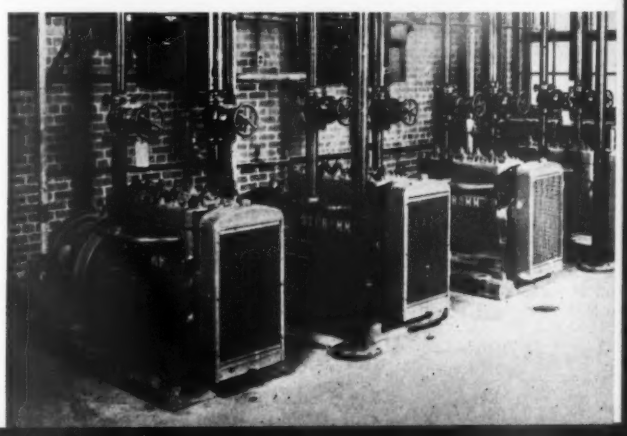


Fig. 5. Four of seven compressors installed in a large armor plate plant where the unit system was more desirable than a centrally located plant because the varying compressor loads necessitated the use of only one or two compressors most of the time but all the compressors for a complete load requirement.

Photo courtesy Schramm, Inc.

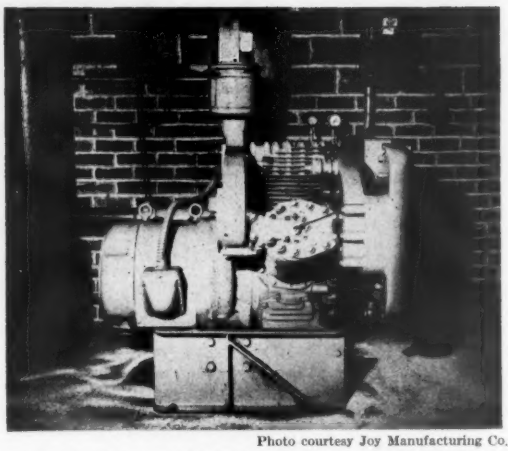


Photo courtesy Joy Manufacturing Co.

Fig. 6. The model WL-80 air compressor, 295 cfm, is considered ideal for decentralized air power since it can be easily moved and needs no special foundation.

or at the points of occasional heavy use. Many peak demands for compressed air are instantaneous or relatively very short and storage capacity near such points avoids excessive drop.

D. Provide frequent outlets on each header or main for attaching hose for air-operated equipment, always putting the outlet at the top of the pipe line to prevent carry-over of condensed moisture to the tool. Frequent outlets result in shorter hose length and, therefore, less pressure drop through the hose.

E. Arrange all piping so that it slopes toward a drop leg or moisture trap in order that condensed moisture may be removed from the piping system and prevent it from being carried over into the air tools or compressed air-operated devices where it is very harmful.

Fig. 8. Dual installation of two-stage, single-acting air compressors supplies air for many machine operations. Compressors are motor-driven.

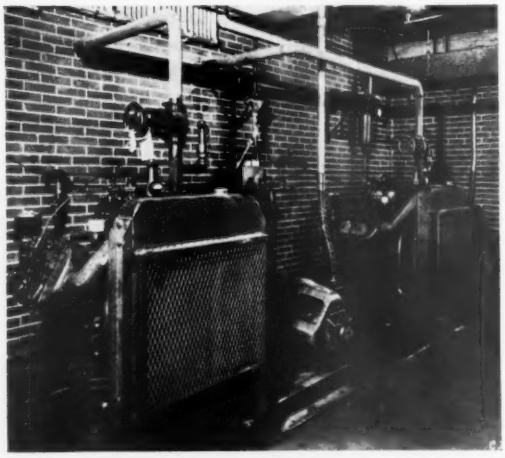


Photo courtesy Ingersoll-Rand Co.

Fig. 7. A 7½" stroke XLE compressor, with aftercooler and receiver, installed in the plant of a leading machine tool builder.

TYPE OF COMPRESSOR

Following the five analyses and thorough consideration of the data obtained, the selection of the particular type of compressor, that is, reciprocating, rotary or centrifugal, should be based on consultation with various manufacturers whose engineers are best qualified to make such recommendations.

Before finally determining the precise type of compressor to be installed, consideration should also be given to the various types of power used to drive compressors—electricity, steam, oil, gas or gasoline. The type of drive deserves careful study from the standpoint of first cost, operating cost, reliability of power or fuel supply and maintenance. Anticipated plant load factor will also occasionally have a bearing on the selection.

Stationary Reciprocating Compressors and Vacuum Pumps. The reciprocating type of compressor, which includes portable air compressors, compresses air by a piston moving back and forth in a cylinder. The accompanying illustrations suggest the range in size and types of stationary reciprocating air compressors. In no sense should the group shown be regarded as a complete catalog of the equipment being made by compressor manufacturers or as a complete representation of the types and uses of air compressors.

Many general types of stationary reciprocating compressors are covered here. One type is an air cooled, two-stage, single-acting, 40-horsepower motor driven air compressor which supplies air power for a number of operations.

This compressor is the multi-cylinder stationary type with built-in motor. It is known

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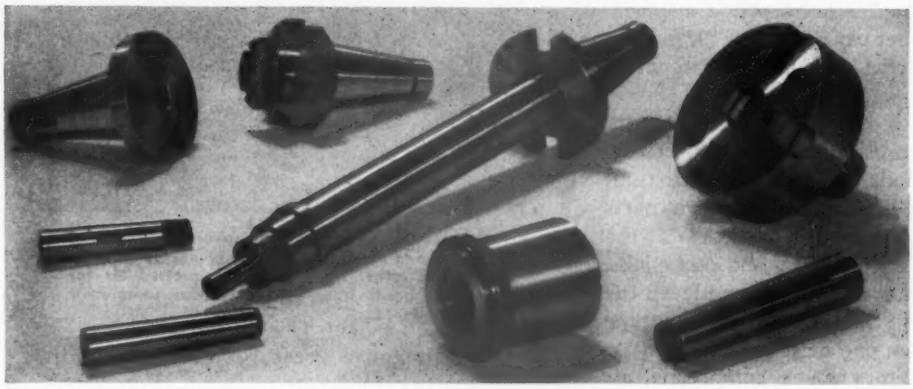

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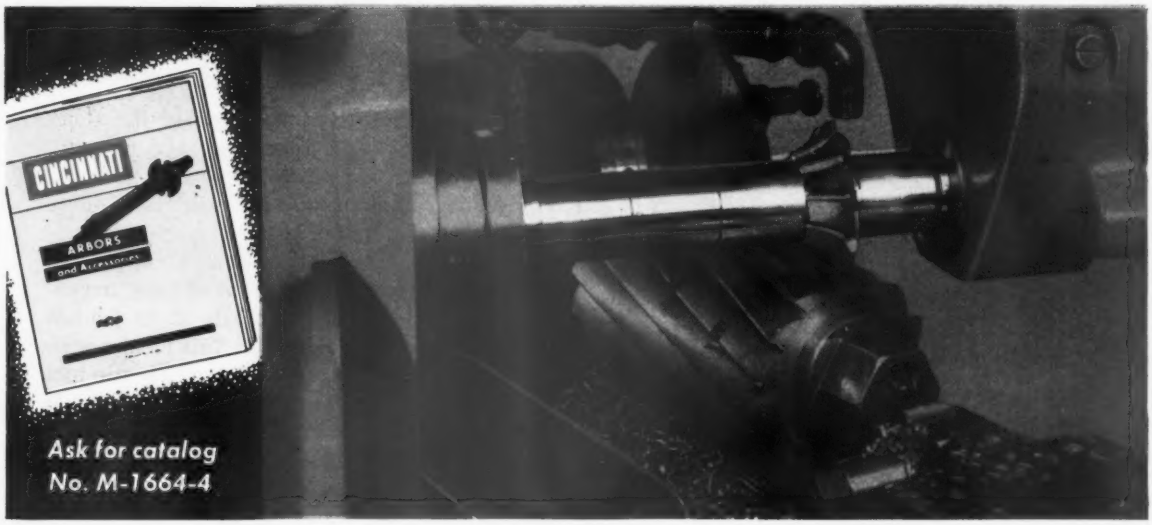

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. . . Air Power, from page 66

as a motor compressor. It is widely used in many industries. For example, the air compressors illustrated in Figure 8 are used in a manufacturing plant to supply air for many machine operations. This is a dual installation of vertical, two-stage, single-acting air compressors. Each machine has a piston displacement of 285 cubic feet per minute at 100 pounds pressure. V-belt drive is from a 50-horsepower motor.

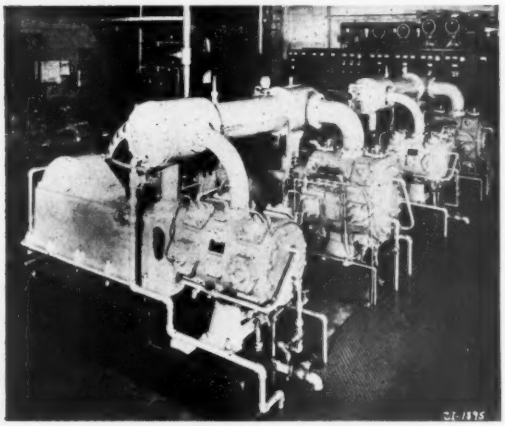
Another variation of the multi-cylinder single acting air compressor is illustrated in Figture 9. Here are four of a total of 17 air compressors scattered throughout a large parts manufacturing plant to meet the needs of the grinding, drilling, air chucking and other jobs. In this case, the parts manufacturer placed the compressors close to the work rather than pipe compressed air from one large central plant to all areas of the factory where compressed air is required.

Single horizontal or vertical double acting compressors are another general type, also referred to as straightline compressors.

The two-stage Y compressor, with motor mounted on shaft, is illustrated in **Figure 11.** It supplies the general compressed air requirements of a sheet metal shop and foundry.

Rotary Sliding-Vane Type Compressors and Vacuum Pumps. The rotary sliding-vane compressor is a machine in which longitudinal vanes slide radially in a rotor mounted eccentrically in a cylinder. A single-stage compressor is capable of developing about 50 pounds per square inch gauge pressure. Two stages in series are capable of developing up to about 125 pounds per square inch gauge pressure.

Fig. 10. These two duplex, 250 hp synchronous motor-driven air compressors supply the power for tools and devices used by an aircraft engine manufacturer. This compressor installation is fitted with five-step control. A remotely-mounted governor incorporates automatic initial unloading and automatic resynchronizing on voltage dips.



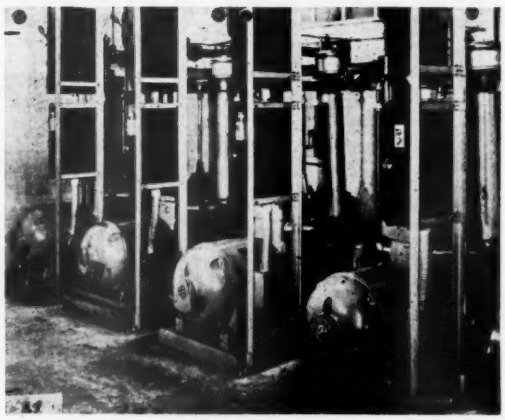


Fig. 9. Multi-cylinder air compressors are scattered through a large metal parts plant for immediate area requirements rather than taking compressed air for entire plant needs from one central air compressor plant.

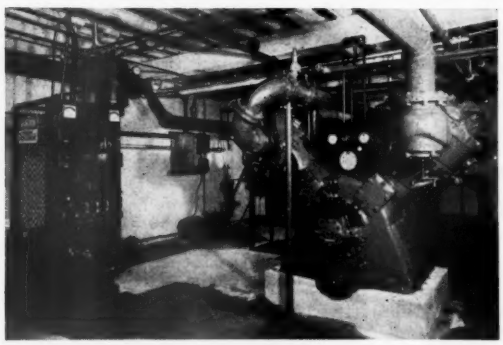
LOW AIR PRESSURE CAUSES — EFFECTS — REMEDIES

Low air pressure is an abuse of the Compressed Air System—is a costly and wasteful practice which should not be tolerated.

By "low air pressure" is meant inadequate pressure at the tool or the device which is air-operated. It is at this point that the air is used as power. Most of the pneumatic tools, for example, are designed to operate at 90 pounds gauge maximum at the tool. This means pressure at the point where the air enters the tool while the tool is operating. If the pressure is below the range of 85 to 90 pounds gauge, then it should be considered too low since it reduces the ability of the tool to do the maximum work for which it was designed.

. . . *Continued on page 72*

Fig. 11. Two-stage Y compressor installed in foundry and sheet metal shop.



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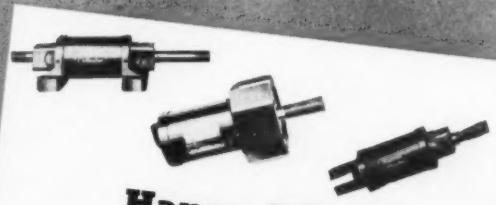

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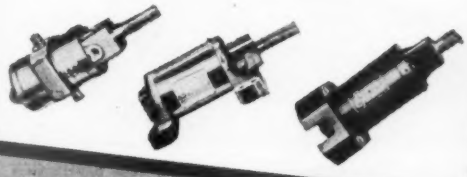

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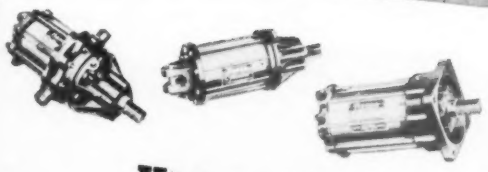

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. . . Aluminum Plate, from page 48

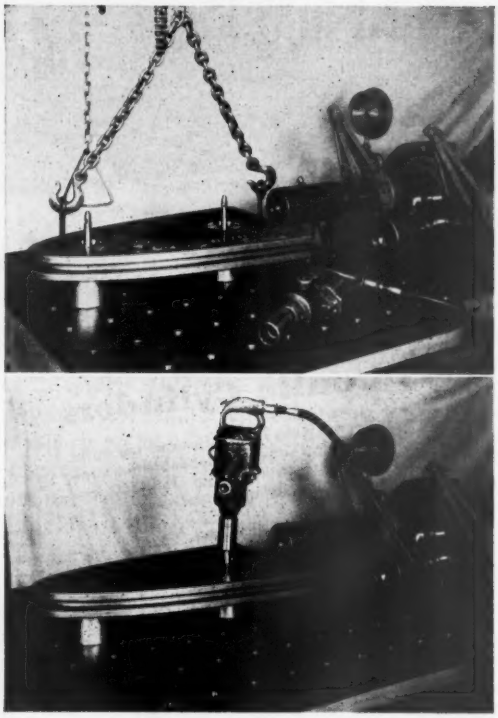

Fig. 5. Above: Lowering aluminum nose hat section die over guide-down locating pins, on Hufford press at Douglas Aircraft. Below: Bolting nose hat section die in place.

Fig. 8. Parts located by aluminum contour plates of assembly jig which builds the side panel of the fuselage of fast Navy fighter, at Douglas Aircraft.

Fig. 6. Aluminum jig at Douglas Aircraft holds parts in position while operator runs machine which punches hole, inserts and squeezes rivet.

Fig. 7. Girls building a watertight bulkhead for the Navy R3Y water-based aircraft at Consolidated Vultee Aircraft Corp. Note thick aluminum plate on jig table.

Fig. 9. In this aircraft assembly fixture at Bell Aircraft, the contour boards are made from cast aluminum tool and jig plate.

. . . Continued on page 133

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Photo courtesy of Gardner-Denver Co.

Fig. 12. Dual installation of Model WBQ air compressors installed in a large radio manufacturing plant.

. . . Air Power, from page 68

The Causes of Low Air Pressure

The causes of low air pressure are easily classified:

1. Insufficient compressor capacity.
2. Inadequate piping.
3. Leakage.

When it is discovered that pressure is too low, the first inclination is to install more compressor capacity. This is not necessarily the correct answer. It should first be determined whether the compressors are at full load when the air pressure is low. If they are, then more compressor capacity may be required but, even then, consideration must first be given to two other common causes of low air pressure.

The second cause is "inadequate piping." A measure of the adequacy of piping is the pressure loss between the air receiver, where the compressor endeavors to maintain a constant pressure, and the point of use. This should not exceed 10 per cent in a well designed system. The absolute maximum drop for the worst point in the system should not exceed 15 per cent. If the pressure drop is greater than 10 per cent average, 15 per cent maximum, throughout the entire distribution system (including hose), then attention should be given to correction of this fault before considering increased compressor capacity.

A third cause of low air pressure is leakage or loss of air without doing work. It has been pointed out that permitting excessive leakage is the same as exhausting the output of a compressor directly to atmosphere.

Obviously, if leakage is eliminated, the compressed air formerly wasted will be available for useful work. The expense of making lines tight will undoubtedly be less than the installed cost of a new compressor, while the daily power saving may be considerable.

The Effects of Low Air Pressure

There are very few uses of compressed air not vitally influenced by low air pressure. All portable pneumatic tools, loaders, all pneumatic transfer and conveyor systems, paint sprays, oil burners, sandblasts, air lift pumps, etc., operate less effectively when the proper air pressure is not maintained.

The positive result of increasing air pressure to the proper value is:

1. Increased production
2. Reduced cost per unit produced.

The economic advantages of increased air pressure, (or conversely, the losses due to low pressure), can be illustrated. An average increase of 37 per cent in production can be obtained for about 30 per cent increase in air consumption by increasing the air pressure at the tools from 70 pounds to 90 pounds.

Consider an installation of 20 grinders operating from an $8500.00 compressor plant, first at 70-pound gauge and then at 90-pound gauge.

With power at 1c per kilowatt-hour, fixed charges at 15 per cent of installed cost, plus labor and supplies, air at 100-pound pressure costs 7c per 1000 cubic feet.

The tabulation at the top of the next page brings out pertinent data.

Assuming that only one-third of the 37 per cent increase in tool productivity can be translated into labor productivity, it is evident that 12 per cent more metal will be removed with 90-pound gauge air pressure than with 70-pound gauge air pressure. The work previously done for $331.20 can now be done in less time and will reduce the cost to $335.19 divided by 1.12, or $299.27. Thus, even though air costs are increased, there is a net saving of $31.93 per day, or about $8300.00 per year (almost equal to the first cost of the compressor plant).

When the question arises of purchasing additional compressor capacity as opposed to making other arrangements for the operations involved in a shop, it should be remembered that adding to compressor plant capacity frequently affords protection for many vital shop operations other than the operation of pneumatic tools. Among these are sandblasting, paint spraying, hoisting, agitation of liquids, air jet vacuum equipment for cleaning foundry sand, operating controls in power plants, air chucks

Operating Air Pressure at compressor	100 lb. ga.	100 lb. ga.
Operating Air Pressure at tools	70 lb. ga.	90 lb. ga.
Tool Load Factor	33%	33%
CFM Required per tool at maximum load	50	68
Number of men and tools	20	20
Total CFM used	333	453
Total cu. ft. used per 8-hr. day	160,000	217,600
Cost of air per 1000 cu. ft.	$ .07	$ .07
Cost of air per day	11.20	15.19
Increased air cost	....	3.99
Labor rate per 8-hr. day (incl. burden)	16.00	16.00
Total labor cost per day	320.00	320.00
Total cost per day	331.20	335.19
Ratio of air cost to total cost	3.38%	4.53%

in a machine shop, safety devices on punch presses, air jets for ejecting parts from presses, etc.

The Remedies for Low Air Pressure

The remedies for low air pressure are just as definite as the causes and effects.

Faulty air power conditions are usually due to poor planning or to increased air uses without corresponding system expansion. Plant-wide analysis should determine the full extent of low air pressure and the present air flow requirements. Future growth must also be considered.

Pressure loss varies roughly as the square of the velocity of air flowing through the pipe. For example, a 3-inch line, 1000 feet long, will handle 500 cubic feet per minute with a 2.5-pound pressure loss, while a 4-inch line will pass about 1000 cubic feet per minute with the same drop. The installed cost of the 4-inch line will, however, be very little more than that of the 3-inch line, since most of the cost is labor.

Methods of increasing pipe line capacity to decrease pressure loss and improve conditions at the point of use vary with different installations. One may call for a line paralleling the original, with frequent interconnections; another may require installation of a loop system with some outlets taken off the new line to relieve the old; still another may need a complete new system.

Branch lines and manifolds for attachment of tools, etc., should be planned "oversize."

Not the least of the problems of correct system layout is the selection of proper hose for final transmission of compressed air to the tool. Losses of 15 to 25 percent in air pressure are frequent in the hose alone. Don't use a hose longer than is necessary to make the tool available to the work and to give proper freedom of movement to the operator.

Every cubic foot of leakage eliminated is pure gain. Such losses in many systems will reach 10 per cent to 20 per cent of the total air compressed. An air leakage test should be run on the complete plant and every section of hose should be inspected. Although leaks are usually small, they may be numerous, having a high total effect. A single 1/16-inch hole will waste 182,000 cubic feet per month, costing $9.10.

The most likely locations of small leaks are around valve stems, in hose connections, unions, drains, homemade blow guns, and lines leading to inoperative tools.

Only after it has been determined that the distribution system is adequate and that leakage has been eliminated, should increase in compressor capacity be considered.

(To Be Continued)

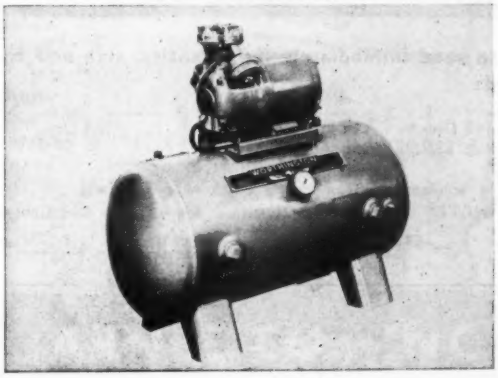

Fig. 13. Single-stage, 150-psi air compressor with built-in motor, either tank-mounted or base-mounted, widely used for standby or spot application, or by small shops.

Photo courtesy Worthington Corp.

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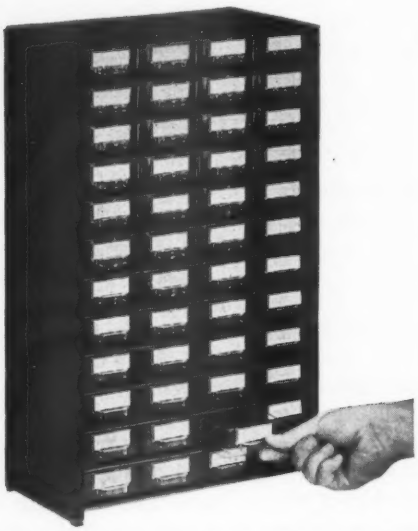

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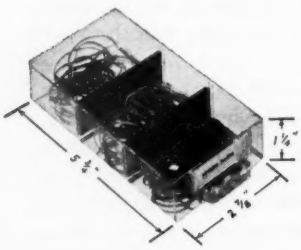

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INVESTMENT CASTING INSTITUTE HOLDS FIRST MEETING

With more than a year of organizational planning behind them, the Investment Casting Institute launched its first industry-wide meeting on May 6th at Cleveland's Hotel Carter. More than 30 companies make up the Institute which is concerned with the production of industrial metal castings made with expendable patterns and monolithic molds.

The Institute, which was organized to bring customers — in both industry and government — a uniform product through industry-wide specifications and standards plus the education on the advantages of investment castings, has already begun work on its initial goals of standardization of nomenclature, standardization of cast properties (insofar as possible), creation of a news bureau, and the gathering of statistics.

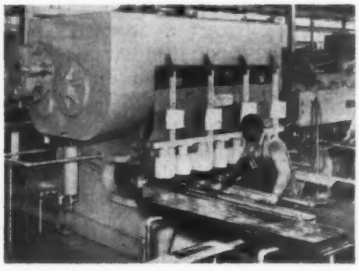
The first industry-wide meeting was highlighted by talks by leading authorities in the investment casting field. These talks dealt with both technical and marketing problems faced by the industry.

In more detail, among the long range objectives of the Institute are (1) the standardization of nomenclature, specifications and testing procedures within the industry; (2) establishment of the Institute's role on behalf of the industry in relations with the government, and conversely the circulating of the membership with bulletins clarifying government policies pertinent to the industry; (3) the collecting and publishing of statistics and other useful information for membership consumption; (4) the providing of a forum for the voluntary exchange of technical information and problems within the industry, and the establishing of a liaison between manufacturers, vendors, and technical societies associated with investment castings, to promote better working conditions and higher efficiencies; and (5) the acceleration of the growth of the industry by study and publication of the features and advantages of investment casting.

Officers of the Institute include: President, K. M. Bartlett, Thompson Products, Inc., Cleveland; Vice President, V. S. Lazzara, Casting Engineers, Inc., Chicago; Executive Secretary, H. P. Dolan, Chicago.

Firm Expands Metal Shearing Facilities

The installation of new equipment in an industrial plant is seldom of signal importance. However, the acquisition of a new Steelweld shear by Ducommun Metals & Supply Company at their Los Angeles plant is of particular significance, not only because the new machine materially increases the facilities of their metal shearing department,



but because this mechanical monster is capable of taking steel plates up to and including a thickness of one inch and slicing them with ease.

A special feature of this new shear, that is of great convenience and aid in speeding production, is the lift-up type back gauge which can be raised up and out of the way to allow long plates to pass through. It is easily manipulated by movement of the horizontal bar.

The capacity of this shear is 6′ x 1″, and it will produce 35 strokes per minute. The rake angle taper per foot is ⅝″. Front gauge range is 60″, and the back gauge range is 36″. Maximum hold-down pressure is 24 tons, and the bed of the shear is 34″ high and 24″ wide.

Ducommun Metals & Supply Company, industrial distributors, carries huge stocks of steel plate, cold and hot rolled steel, bars, angles, tubes and tubing, aluminum, stainless, copper and brass. The firm added the shear to expedite filling steel orders where shearing is required.

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WESTERN PLANT MAINTENANCE JULY CONFERENCE

Concurrent with the First Western Plant Maintenance Show, to be held at the Pan Pacific Auditorium in Los Angeles on July 13-14-15, will be the Western Plant Maintenance Conference. The Conference, scheduled for July 13 and 14, will be held in the Ambassador Hotel in Los Angeles.

Like the Show, with its hundreds of displays and exhibits, the Conference is aimed at directly aiding in solving the maintenance problems of production executives and management engineers in Western industry. To this end the Conference will offer a program of discussions and lectures directed toward separate levels of industrial maintenance — management, supervisory, and technical — and programs directed toward maintenance in special industries, including aircraft, electrical, metalworking, food processing, and petroleum processing.

Principles of Maintenance Organization and Management will be covered by a lecture by Maurice Olchoff, Plant Engineer, Solar Aircraft Co., Des Moines, Iowa. Mr. Olchoff will handle such problems as management-maintenance, design-maintenance, and production maintenance relationships, and the basic factors determining the maintenance setup, duties, personnel, payroll, shifts, etc.

A program on planning and scheduling maintenance operations will be presented by George J. Martin, Manager Mechanical Division, National Biscuit Co., New York, N. Y. Such questions as the amount of paper work, work measurement, planning for the two types of maintenance — routine and emergency, budgeting and time-saving are to be the topics of his lecture.

The Aircraft Industries, which are part of the western transportation equipment industries that have grown by 93% between 1947 and 1951, have special maintenance problems which are to be discussed by C. M. Vigil, General Foreman Maintenance, Douglas Aircraft Co., Inc., El Segundo

Div., El Segundo, Calif., and chairman Roy Fisher, Chief Engineer, Rheem Manufacturing Co., Downey, Calif.

Maintenance in Metal-Working Plants will have as chairman, Don L. Newton, Works Manager, Kwikset Locks, Inc., Anaheim, Calif., and as discussion leader, James M. Weeks, Plant Engineer, Plomb Tool Co., Los Angeles. For an industry which has grown from $361 million to $552 million between 1947 and 1951, the problems of maintenance such as planning, preventive, inspection, records, lubrication, upkeep of transmission, bearings, clutches, couplings, speed reducers, pumps, and compressors, are the important topics under study.

The speaker on Small Plant Maintenance will be C. A. Gallaher, Plant Engineer Anaheim Div., Robertshaw-Fulton, Anaheim, Calif. The division of supervisory staff, clerks, etc., the amount of justifiable paper work, the division of preventive and breakdown work, and under what conditions work should be contracted out — These are the questions for which up-to-date solutions will be sought.

There will be a number of other speakers and panel discussions covering a wide range of maintenance subjects.

The increased costs of production labor and equipment have made the cost of downtime extremely high and are responsible, in part, for the necessity of larger maintenance staffs in relation to production staffs. As a result of this growth in the number of people engaged in maintenance work, the division of duties, the exact scheduling of time, and the necessity for keeping records, are all problems basic to maintenance procedure in every type of Western industry. The answers to these and to the specific difficulties facing each type of industry will be sought in the Western Plant Maintenance Conference.

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(*Below*) — Norco basic jigs for round stock are time and money savers, too! Available for manual or air operation.

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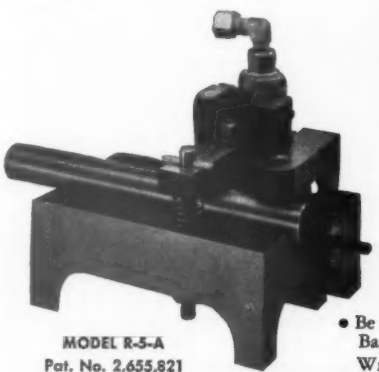

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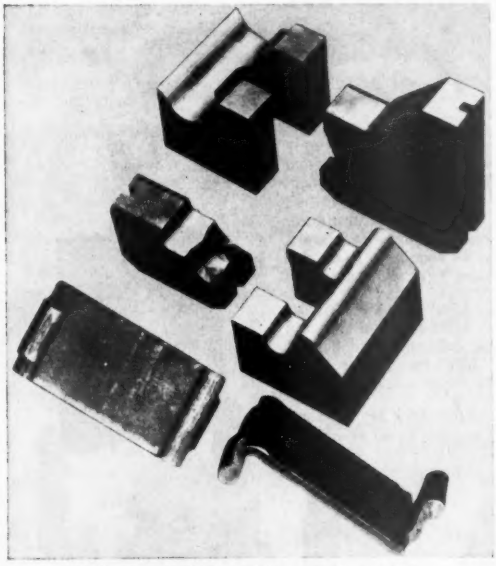

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CIRCLE INFORM-A-GRAM KEY NO. 78

DECLINING-BALANCE DEPRECIATION IS NEEDED BY INDUSTRY

No "incentive taxation" is needed to persuade manufacturers to modernize, A. V. Bodine president of the Bodine Corporation, Bridgeport, Conn., told members of the New England Council at its recent Industrial Opportunity Conference.

All that is necessary to speed modernization, Bodine pointed out, is to remove the tax penalty upon modernization which government has for years imposed upon industry through regulations of the Internal Revenue Department covering depreciation allowances.

"Today, when buyers of machine tools face the arithmetic of modernization", Bodine said, "they find themselves subjected to a terrific tax penalty because they are bound by the provision of Treasury Decision 4422 and Bulletin "F". When to these limitations is added the inflation factor, the result is that, in most cases, only a minor share of the cost of new equipment can be met by depreciation previously accumulated on the machines to be replaced, and the major share of the cost of modernization must be met out of earnings after taxes. Furthermore, with depreciation enforced over at least a 20-year period, they cannot expect to recover the capital invested within the period of the useful and profitable life of the equipment purchased.

"The fact is that the use of depreciation as a taxing device has penalized modernization, saddled the country with creeping obsolescence, and imposed the final bill upon the public in terms of unnecessarily high production costs. The remedy is to stop using depreciation as a means of raising tax revenue and return to the concept of depreciation as a matter having to do with recovery of capital."

A declining-balance method of computing depreciation, Sect. 167, HR 8300, which will permit recovery of about two-thirds of the cost of a machine within the first half of its "useful life" would effect an increase in Federal income, Bodine said.

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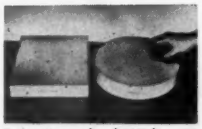

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Arbor for ¼" Collet — $ .60

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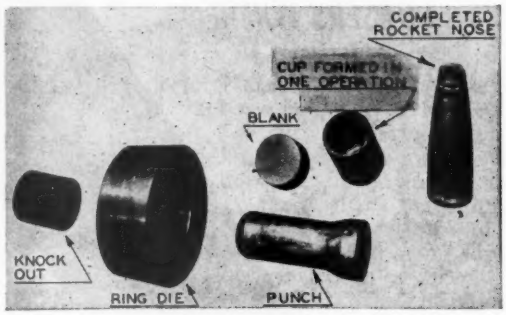
CIRCLE INFORM-A-GRAM KEY NO. 801

Power Extruding Requires Tough Tool Steels

Power extrusion, a relatively new and promising method of cold forming steel in this country, is being used successfully in a large midwestern manufacturing plant for the production of rocket projectile noses.

By power extruding — sometimes called "cold extruding" and "backward extruding" — this manufacturer was able to lower fabricating costs as well as increase production. A significant share of this success was due to the tool and die steels used in the job.

The part described is the first operation in cold forming the nose piece. It is made from SAE 1010 steel. From the start, it was obvious



Photos courtesy The Carpenter Steel Co.

that the main problem would be in the first stage of extruding the steel slug. Once that was solved, the company's engineers figured the remaining stages of manufacture would fall into a routine pattern.

Punch Problem Solved

Finding tool or die steels that could withstand the tremendous strain of the impact was a stubborn problem in getting the job underway. Seventeen hundred tons of pressure are exerted on a 2500-ton capacity press in the first operation.

For the punch, many steels, including high speed steels, were tried. The highest production from any of them was about 3,000 pieces. The difficulty lay in the inability of the steel to stand up under this type of service without prematurely upsetting and cracking.

Finally chosen for the job was Carpenter Star-Zenith, an 18-4-1 high speed steel. At the last report, the Star-Zenith punch had already produced more than 14,000 pieces and was still in operation.

. . . *Continued on page 84*

Will You Be There?

July 13. National Federation of Metal Finishers. 2nd Management Seminar. Statler Hotel, New York City.

•

July 13-14. Western Plant Maintenance Conference. Ambassador Hotel, Los Angeles.

•

July 13-15. Western Plant Maintenance Show. Pan Pacific Auditorium, Los Angeles.

•

Aug. 23-Sept. 3. Automatic Control of Machine Tools. Summer Program. Massachusetts Institute of Technology. Cambridge, Mass.

•

Sept. 8-15. 2nd Advanced Conference Series on Applied Statistics and Statistical Quality Control. Rutgers University, New Brunswick, N. J.

•

Sept. 13-16. Society of Automotive Engineers. Tractor Meeting and Production Forum. Hotel Schroeder, Milwaukee.

•

Sept. 13-23. Fourth European Machine Tool Exhibition. Milan, Italy.

•

Sept. 13-24. Instrument Society of America. First International Instrument Congress and Exposition. Commercial Museum and Auditorium, Philadelphia.

•

Sept. 24-25. Colloquium at Stresa, Italy. "Automation of Measuring".

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Sept. 28-30. 9th Annual National Industrial Packaging and Materials Handling Exposition. Chicago Coliseum. Chicago.

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Sept. 28 — Oct. 1. Iron and Steel Exposition. Cleveland Public Auditorium. Cleveland.

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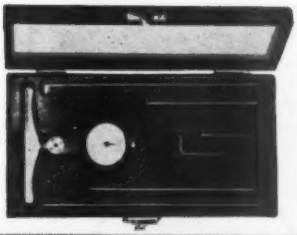

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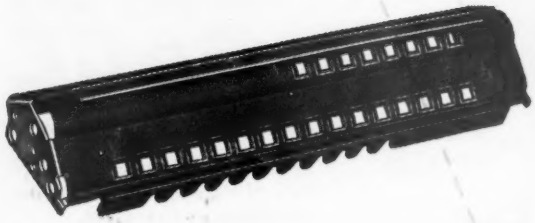
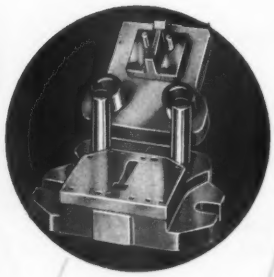
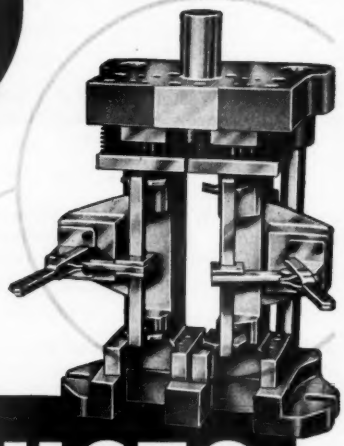
PRODUCTO *Catalog* DIE SETS

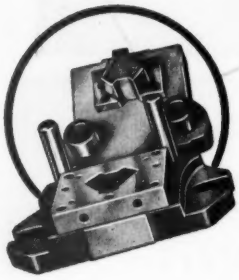
SOLVE SPECIAL STAMPING PROBLEM FOR MONROE



The Problem:
Stamping end-plate holes in the carriage cover of the Monroe Adding Calculator.







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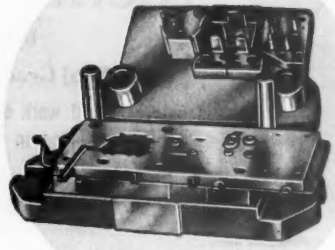

THE DIE MANUFACTURER:
The Connecticut Tool and Engineering Co., Bridgeport, Conn.

The lofty die, at right, represents the last critical stamping operation in the production of the Monroe carriage cover, shown above. It's unusual because it pierces close-tolerance end holes in either 10″ or 12″ covers *after* they have been assembled. The die set that controls this precise piercing operation both looks and performs like a "special" made-to-order set. Actually, it is a rear pin catalog set fitted with 1¼″ x 16″ pins. Even with the long guide pins, the highly accurate parallelism is maintained. Yes, Monroe is getting the benefit of a "special" without paying for extras in time and expense.

In all, 12 Producto catalog die sets are used in stamping and forming this assembly. Only the one with the long guide pins is unusual in size or shape but *all* require the utmost in precision and dependability. The point to remember is this: Whether you require a "made-to-order" special or a "quick-to-order" catalog die set, you'll get the *best* from Producto.

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CIRCLE INFORM-A-GRAM KEY NO. 821

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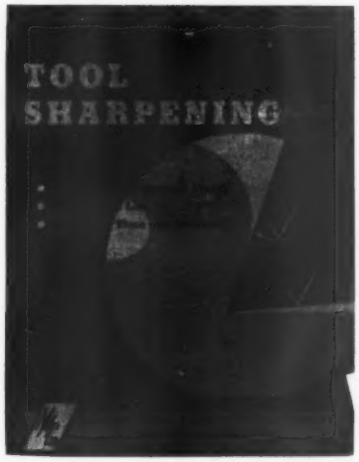
Coated Abrasives for grinding and finishing non-ferrous metals are described in a new booklet available from the Minnesota Mining and Mfg. Co., 900 Faquier St., St. Paul 6, Minn. The publication shows the use of coated abrasives in the finishing of patterns, molds and dies; and the use of pressure-sensitive tapes in non-ferrous foundries. Also included are diagrams of floor and bench backstands, the platen sander and the portable disc grinder, which are the most common types of machines employing coated abrasives for grinding and finishing of non-ferrous metals.
Circle Inform-A-Gram No. C1.

Metal Cutting Band Saws, their care and use, are covered in a booklet available from the Simonds Saw and Steel Co., Fitchburg, Mass. Illustrations and diagrams are included.
Circle Inform-A-Gram No. C2.

TOOL SHARPENING

Case histories describing an increase in tool life of 90 to 1,000% are given in a bulletin (Form L22) now available from the Micrometrical Mfg. Co., 345 S. Main St., Ann



Arbor, Mich. The bulletin explains how time, tools and material are saved when cutting tools produce a consistent finish; what to do to obtain more consistent finish and more pieces per grind; and why cutting tools often produce a non-consistent finish.
Circle Inform-A-Gram No. C3.

PATTERN BUYERS GUIDE

Here is a manual designed to make available a general method of pattern selection. It is primarily intended to assist those not employed in the pattern or foundry industry, but who are none the less confronted with the complex problems of selecting pattern equipment. This reference book contains a complete glossary of

terms and is profusely illustrated. A brief description is given of the features found in cast iron patterns, brass patterns, permanent molds, aluminum patterns and matchplates, hardwood equipment, pine patterns of various grades and green-sand-core molds. For your copy of the book write to Master Pattern and Mold Co., Dept. 9, 1313 Main Ave., Cleveland 13, Ohio, or—
Circle Inform-A-Gram No. C4.

Light Metal Facts. Basic data on magnesium and aluminum casting alloys are contained in a booklet, "Book of Facts," by the Eclipse-Pioneer Division of the Bendix Aviation Corp., Teterboro, N. J. Specifications, composition and mechanical properties of the metals are discussed.
Circle Inform-A-Gram No. C5.

Tool Shape Identification Chart. An unusual "Carbide Tool Identification Chart", which illustrates in actual size the various shapes of mounted points and carbide burrs, is available from the Metal Removal Co., 1546 N. Orleans St., Chicago 10, Ill. Included in the chart are three tables presenting data on tap drills and twist drill and steel wire gauge.
Circle Inform-A-Gram No. C6.

Tool & Die Steel Manual. Important information on the heat treatment of tool steel is contained in a tool and die steel manual which is available from The Carpenter Steel Co., Reading, Pa. Also, descriptions, properties, treating instructions and standard stock sizes are given on 12 Carpenter matched tool steels.
Circle Inform-A-Gram No. C7.

Machining Characteristics of metals and alloys play an important role in determining costs and the subsequent margin of profit (or loss) in all commercial metal cutting operations. A booklet is offered by the Titan Mfg. Co., Bellefonte, Pa., which presents laboratory and actual production results obtained from a series of tests on leaded steel and free cutting brass rod. The results are published in an effort to properly evaluate the machining performances of these materials.
Circle Inform-A-Gram No. C8.

FOR STEEL CASTING

This handy slide chart gives the nominal analyses, various designations, minimum mechanical properties and heat treatment for 19 Lebanon carbon and low alloy grades and 17 stainless and corrosion-resistant grades. The selector is available from Lebanon Steel Foundry, 60 Lehman St., Lebanon, Pa.
Circle Inform-A-Gram No. C9.

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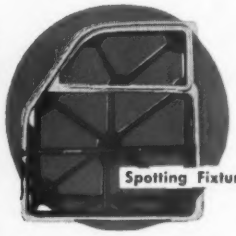
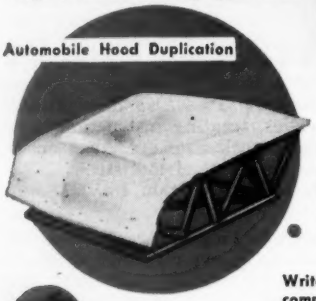


Spotting Fixture

Automobile Hood Duplication



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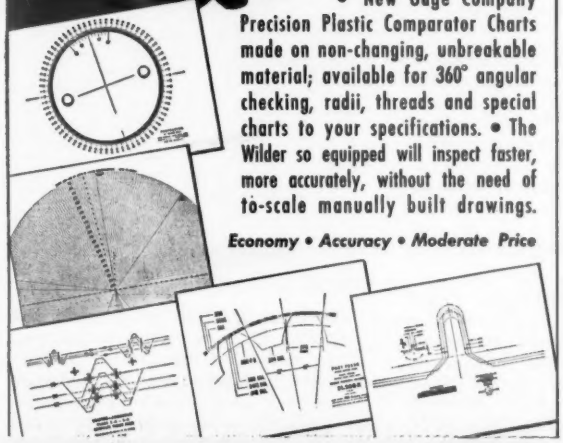

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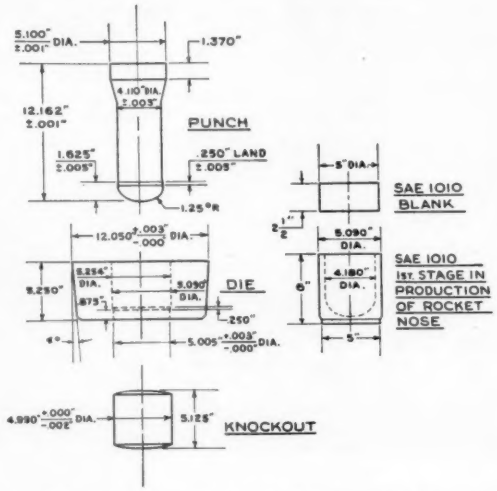
CIRCLE INFORM-A-GRAM KEY NO. 842

. . . Power Extruding, from page 80

Heat treatment of the punch consists of hardening in a salt bath from a temperature of 2350°F, and then double drawing at 1050°F to a hardness of Rockwell C-62/64. After drawing, the punch is given a liquid nitride treatment for five hours at 1000°F. This treatment develops a surface hardness of approximately 72/74 Rockwell-C to a depth of about .001".

The temperature developed in the punch during the extruding operation is about 500°F — and this temperature is maintained constant-



ly. When the press is idle between shifts, the temperature is held at 500°F with a special heating jacket.

The knock-out is also made of high speed steel and treated to the same hardness as the punch.

Choosing The Ring Die Steel

Thorough investigation was also necessary in solving the problem of getting good life from the ring die. Again many different tool steels were tried with little success. The best performance from any tool steel averaged about 100 pieces.

After extensive testing, the plant decided to use Carpenter Vega, a manganese-chromium-molybdenum, non-deforming, air-hardening die steel. When last reported, the Vega ring had turned out 23,000 cups and was still in operation.

This ring is given the standard heat treatment and put into operation at a hardness of Rockwell C-58/60. The manufacturer's metallurgist commented on the simplicity of hardening the Vega ring. There is no need for high temperature furnaces or packing. The scale flakes off the tools cleanly in air cooling. Another advantage of the steel in this applica-

. . . Continued on page 140

HIGH SPEED STEEL SAW BANDS

by H. J. Chamberland
Research Engineer

THE DoALL COMPANY
Des Plaines, Illinois

BACK IN 1934 it was not unusual for a die or tool maker to consume 8 days drilling, hammering and filing a die. Then along came the contour sawing and filing machine to complete the same die in 8 hours, and this was only the beginning. Other discoveries along these lines followed from time to time and the various techniques whereby unit cost could be controlled to the lowest possible figure were fully described in the June 1952 issue of this publication. The fact remains that particularly within the last year the band machining process has gone forward at a terrific pace. Production executives who attended the recent American Society of Tool Engineers Industrial Exposition in Philadelphia will surely substantiate this claim.

Demon Saw Blade Advantages	Why
Use of Higher Saw Velocities	It retains cutting edges at the higher temperatures generated at higher band speeds because it has "Red Heat Hardness."
Increased Cutting Rates	(1) More chips produced per minute due to higher permissible operating velocity and (2) bigger chips due to greater beam strength permitting heavier feeding force.
Machines More Pieces per Blade	Longer tool life will result because of its ability to retain hardness and keenness and to resist abrading action at high temperatures.
Broadens Sawing Applications	Affords greater sawing possibilities particularly on tough materials never before band machined.

Now that the tool room has a new manufacturing team — a radically improved line of semi-automatic band machines and the revolutionary Demon high-speed steel saw band in a wide choice of widths, pitches and tooth form, there has to be a substantial increase in production at reduced output costs. Such gains will give the progressive manufacturer a distinct advantage over the user of obsolete machining methods and less versatile and less productive equipment. In short, the following cost figures relating to typical case histories will prove that die steel can now be cut at least twice faster than ever before and don't overlook Test "B" for blade costs.

Economies of the Demon High-Speed Steel Blade:

Lowering the unit production cost makes a big difference in profitable tool room operations. That's exactly what the new high-speed steel blade does, by increasing the production capacity of both the contour sawing machine and die maker. Of all the advantages built into this new type of blading that gives it longer life and ease of sawing, consider just one — it cuts at least twice as fast as any other saw blade. Its "red heat hardness" teeth and greater beam strength permit operation at twice the velocities of carbon steel blades.

OLD BAND MACHINING WAY	
Labor per hour	$ 3.00
Overhead per hour (150% of labor)	4.50
Hours to cut die	8
Labor and overhead cost	$60.00
Cost of carbon steel blade	1.88
Total cost of machining	$61.88
NEW BAND MACHINING WAY	
Labor per hour	$ 3.00
Overhead per hour	4.50
Hours to cut die	4
Labor and overhead cost	$30.00
Cost of Demon high-speed steel blade	10.00
Total cost of machining	$40.00
Unit production cost reduced	$21.88

Test "A"

A little arithmetic shows the big difference between the old and the new in band machining. The above cost figures relate to two identical dies cut from "Ketos" oil-hardening tool steel, one was made 6 months ago and the other recently. Noting that the second die was cut exactly twice as fast as the first, labor and

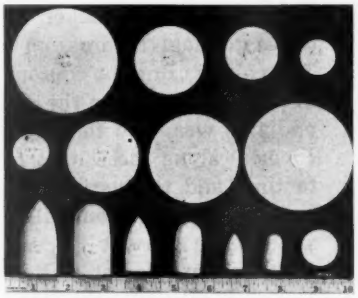
. . . *Continued on page 142*

Felt Finds Increasing Uses for Metal Finishing & Polishing

Keeping pace with metallurgical advances along a broad front, wool felt is being used more and more for finishing and polishing the newer industrial, as well as the older traditional, metals. Felt bobs and wheels in a full range of densities and hardnesses are aiding industry by making possible precision finishing, grinding, polishing and buffing operations in the metals industries. Such uses include the finishing of airplane parts, the polishing of copper engraving plates, cleaning and polishing of saw steel, propeller blades, cutlery, chromium plate, tubing, etc.

Felt for such purposes must be specially engineered for the intended use. Aside from the important property of elasticity, felt can be coated with abrasive grains designed to do a specific finishing or polishing job. Wheels (6″ and over) are tailor-made to rigid specifications in up to nine densities and are operated at speeds as high as 9,000 sfpm. The felt industry has developed, standardized, and is currently turning out in large numbers a wide range of felt bobs (wheels under 6″ diameter) to meet the expanding demand for precision polishing operations.

For surface polishing, the job to be done determines the kind of felt called for. To polish copper plate for etching, for example, felt sheets are mounted on large cylinders. If the job involves finishing recesses in dies for drawing sheet metal, felt bobs are used. On the other hand, wheels made of rock-hard compressed felt are employed for polishing small diameters of metals prior to chrome plating.



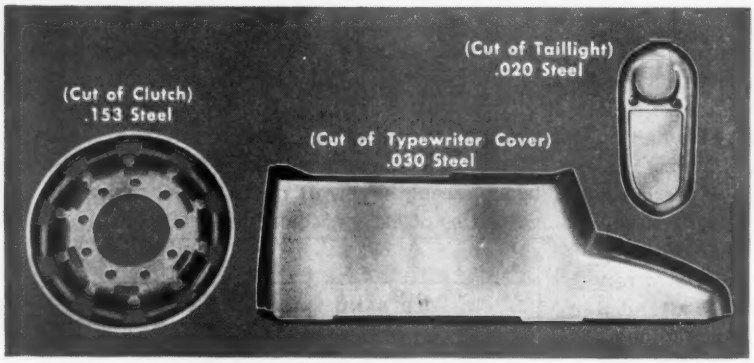
Shown above are felt wheels 1″ to 3″ dia., and 3/16″ to ⅜″ in thickness. The bobs shown on the lower line are 1″ to 2″ long, and made blunt or pointed according to the shape of the work surface to be smoothed.

In grinding, polishing, and buffing operations, felts are used in a number of ways. For polishing relatively soft materials, the hornlike character of the wool fiber itself makes it possible to favor the harder felts for polishing, with no additions or supporting agents. For polishing harder materials, the felt wheels act as carriers for liquids in which abrasive substances are dispersed. About 85% of the felt wheels for surface polishing are "set-up" wheels, that is, wheels coated with glue and rolled in selected grits to form a somewhat permanent abrasive tool, similar in purpose and appearance to the familiar emery wheel.

Standards

Mechanical sheet felts are subject to rigid specifications, thus providing precisely standardized

"ONE PUNCH"
Trims Shells Complete



It costs less to do it faster!

Naturally the Brehm "Shimmy" Trimming Die makes a big *slash* in production costs, because it trims all kinds of drawn shells so much *faster!*

For *instance* . . . stove or refrigerator doors, auto bumper buffers or typewriter covers, from 264 to 900 per hour. Other *varied* shells, large or small, up to 1200 per hour. Costs go *down!*

A Brehm Die, with angular cams, cuts four ways in one press stroke, handling straight, curved, notched or projecting edges . . . true trimming, clean, flat, unburred. Faster and less costly than "horn" or "pinch" trimming.

Almost *any* shape . . . fountain-pen ferrules, artillery cases, watch cases, burial vaults, automotive, kitchen, radio and television accessories, parts, etc. And almost any material . . . gold, silver, stainless or mild steel, copper, brass, zinc, aluminum, fiber, rubber, plastics, etc.

Write today for the Brehm Die Catalog. Or submit blueprints or parts for quotation.

Other special trimming equipment You can free heavy presses from trimming work, with a Brehm Trimming Press, designed for one-stroke trimming with the Brehm Die.

Need to cut tubes? The new Brehm Tube Cutter eliminates waste of tube stock . . . cuts with shearing action . . . fastest cutter made . . . leaves no burrs . . . no reworking.

Get complete facts—write for free catalog and literature.

Brehm TRIMMING DIES

THE "SHIMMY" REG. DIE

THE STEEL PRODUCTS ENGINEERING CO.

BREHM DIE DIV., DEPT. 26, SPRINGFIELD, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 861

materials for metallurgical finishing and polishing operations. Felt manufacturers, through The Felt Association, and with the assistance of the Society of Automotive Engineers, have developed and adopted and are sternly adhering to standards for mechanical felts.

These standards cover four classes of sheet felts: "Fine Spanish," "Spanish," "Fine Mexican,"

Here, two felt wheels are employed in buffing the surface of a precision metal workpiece.

and "Coarse Mexican." The first two are finer types while the latter two are coarser fiber varieties. Each type is made in five different degrees of density: extra soft, soft, medium, hard, and rock-hard.

Standardized sheet felts are applicable to a wide range of technical uses. The extra soft Mexican type, for example, is used to polish aluminum, copper, zinc, and for wiping sheet steel during its manufacture. At the other end of the density range, the extra hard Fine Spanish sheets are cut and turned into wheels and bobs for grinding and polishing metals and other materials, including dentures, glass tumblers, jewelry, leather, etc. Sheet felts are usually produced in one-yard-square pieces in a standard thickness range of ¼" to 3".

Applications in Metal Finishing

Deep drawing dies, combustion chambers for automotive engines, and such diverse products as lipstick holders and darning needles are given their final surface finish with felt bobs or wheels.

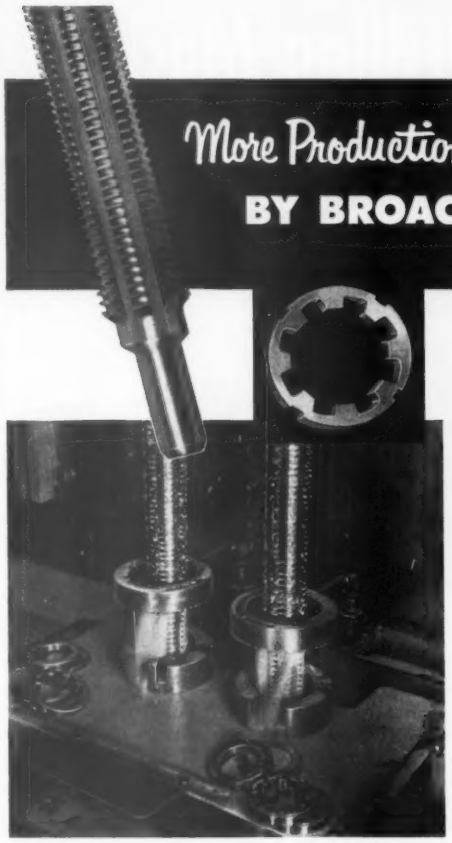
In polishing metal cylinders, to cite an example, felt strips are inserted in metal channels and the edge grain of the strip is used rather than the surface. A Spanish sheet felt is indicated for this job because it is hard, has plenty of life, and can readily hold grinding or polishing compounds.

For precision polishing of propeller blades, and extra hard Mexican sheet felt is used as a base for carborundum abrasives.

Cutlery is polished by being placed between rotating felt rollers with fine pumice as the polishing medium. Spanish sheet felt is favored because of the need for a hard felt which will deliver a scratch-free finish.

Chromium plated automobile parts, such as grilles, often become contaminated with body paint and require cleaning and polishing. Backcheck felt (a form of felt made up in roll goods rather than sheets) is ideal for such jobs because it is extra firm and lint-free, providing a scratch-free finish. It can be readily cleaned with solvents and re-

. . . *Continued on page 137*



More Production, More Profit
BY BROACHING . . .

REMOVE STOCK TO PRECISION LIMITS—FAST . . . ROUGH AND FINISH IN ONE PASS!

The scope of Broaching has broadened in recent years. Many broaching operations do precision work in far less time than other metal-cutting methods.

Continental Engineers have for years been designing all types of cutting tools and broaches. They can recommend without bias your most economical way to do the work.

For facts about increasing your production by broaching, call in your local Ex-Cell-O representative —or write Continental in Detroit for Cutting Tool Catalog.

Internal broaching of a cam ring. Note the complexity of the ring design. The steel is soft and tends to tear, yet this Continental Broach sizes the I.D. and cuts 8 splines 5/16" deep *in one pass.*

CTW

Continental

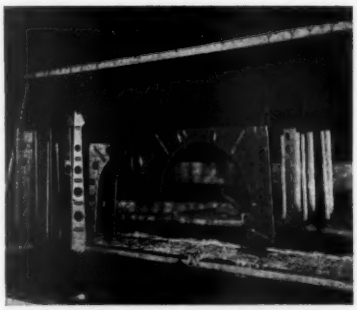
CIRCLE INFORM-A-GRAM KEY NO. 871

QUENCHING DISTORTIONS ELIMINATED BY IMMERSION TECHNIQUE

A unique development in the field of salt-bath-furnace-solution heat treatment for aluminum aircraft parts is cutting the time consumed in this operation by upwards of 40%. This development, called the Free Fall Quench Process, involves changes only in the method used in handling parts scheduled for the heat treatment.

Customarily, aluminum parts are placed in a basket and immersed in a molten salt bath for a given period, removed, and then immediately lowered into a running cold water bath. There are several disadvantages to this system that are well-known throughout the industry.

The first of these is the fact that the large basket used to hold these parts absorbs much of the heat of the salt bath, thereby requiring a longer immersion for the parts contained therein. Also, this basket, when removed from the salt bath, carries with it a good deal of the nitrate salt. This necessitates frequent replenishment of the bath.



Parts are shown suspended from the Martin-developed rotatable tube over the water quench tank. Seconds later, the tube was rotated and the parts fell into the water.

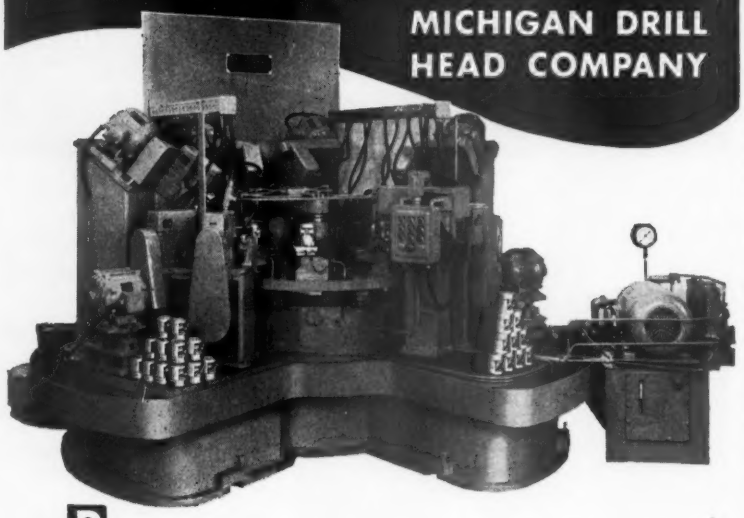
The second, and perhaps biggest, disadvantage is found in the quenching portion of the process. The parts racked in the basket are extremely hot when removed from the salt bath and are immediately placed in the cold water. Because the basket is lowered relatively slowly, the parts enter the cold water in stages. As the basket comes in contact with this water it creates a heterogeneous atmosphere of steam, air and water droplets caused by the splash. These droplets strike the aluminum parts and vaporize, thereby absorbing heat locally and causing variations in the cooling rate of the part. The removal of heat from the part causes the exposed surface to contract and become concave.

Two samples each of two different aircraft parts. The ones showing great distortion were quenched in the normal manner, while the ones that look almost perfect in shape were quenched by the Martin Free Fall process.

Although it takes but a few seconds for the parts to enter the water, they are exposed for a sufficient time to this splash atmosphere to cause, in many cases, severe distortion of the part. This

Special Drilling Machine

DESIGNED AND BUILT BY THE MICHIGAN DRILL HEAD COMPANY



PICTURED is a 12-way, 6-station automatic drilling machine which drills 8 smoke holes and 4 oil holes in an automotive piston. This machine features a turn-around fixture and automatic ejection of the part. As the table indexes, the fixtures are hydraulically positioned to present the proper surfaces to the drills. In station number six, the parts are hydraulically ejected down a chute. The machine uses a standard Michigan 30" Hydraulic Index Table for indexing. This machine will produce 500 pieces per hour.

WE SOLICIT YOUR INQUIRY AS TO ANY SPECIAL DRILLING, MILLING OR BORING OPERATIONS YOU MAY NAME

MICHIGAN DRILL HEAD CO.

971 E. EIGHT-MILE ROAD • HAZEL PARK, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 881

distortion is removed after the bath by hand benchwork — a long process at best.

In the Free Fall Quench process originated by The Glenn L. Martin Company, a new method of handling these aluminum parts was developed. Rather than use baskets in which the parts are stacked, a long pipe containing hanger pins was erected over the tanks. This pipe is rigged so that it can be moved from tank to tank in the process. Parts to be treated are suspended from this pipe by means of stainless steel wires. A loop on one end of the wire hangs from the hanger projection on the pipe.

The pipes are equipped with a counterbalance that causes them to rotate when a trigger is released by the operator. When rotated, the parts suspended on the pipe drop into the bath.

In the first stage of the operation, the pipe with the parts attached is lowered into the salt bath. After a predetermined period in this tank, the pipe is raised, lifting the parts from the bath. It then moves over the cold water bath and, when tripped by the operator, the pipe revolves, dropping the parts into the cold water. Their speed and the angle at which they enter the water is such that a minimum amount of splash is created. After quenching, a basket previously placed in the cold water tank is lifted and the parts are removed.

The advantages to this method are many. In the first place, the nitrate salt does not need additions as often as before because there is no large basket to carry away the salt. In addition, the time required in this stage is shortened due to the fact that no heat is lost on extraneous material; it is all absorbed by the parts requiring treatment. The free fall aspect of the process provides the greatest savings. However, because of the reduction of splash attendant to their entry into the cold water, distortion is reduced by as much as 90%, thereby eliminating a major part of the bench rework previously required.

This unique process is in operation at Martin today. So far it has been found that both large and small aluminum parts can be more efficiently handled by this process and at a considerable savings in time and money.

RIGHT FROM THE START

Is your name on the back cover of this magazine?

If not, you may miss the rest of our *Air Power for Metalworking* series that started on page 54. This series will continue through the next 5 issues and will cover the installations, maintenance and application of air systems. You won't want to miss a single one of these or many other "know-how" articles soon to be published.

For further information on how you can receive *TOOLING and PRODUCTION* Magazine regularly, send us your name, title, company and company address on the Inform-A-Gram Card that is bound into this copy and Circle No. 1975.

Specify Morton
FIXTURE CLAMPS and COMPONENTS
DEPENDABLE . . . . DURABLE
FIXTURE CLAMPS—widest range, in the industry, of sizes and types to fit every requirement.
Jack Locks . . . Cam Locks . . . Hand Knobs . . . Hand Wheels . . . Steel Ball Handles . . . Soft Chuck Jaw Blanks . . . Fixture Cams . . . Set-up Studs . . . Rest Buttons and Rest Pads . . . Spherical and Plain Collar Nuts . . . Quarter Turn Screws . . . Fixture Keys . . . Spherical and Flat Washers . . . Shoulder Screws and many other items. Complete assemblies or individual parts.
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Write for Catalog of most complete line in the industry. Full size tracing templates of each product. Economize with MORTON.

CIRCLE INFORM-A-GRAM KEY NO. 891

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

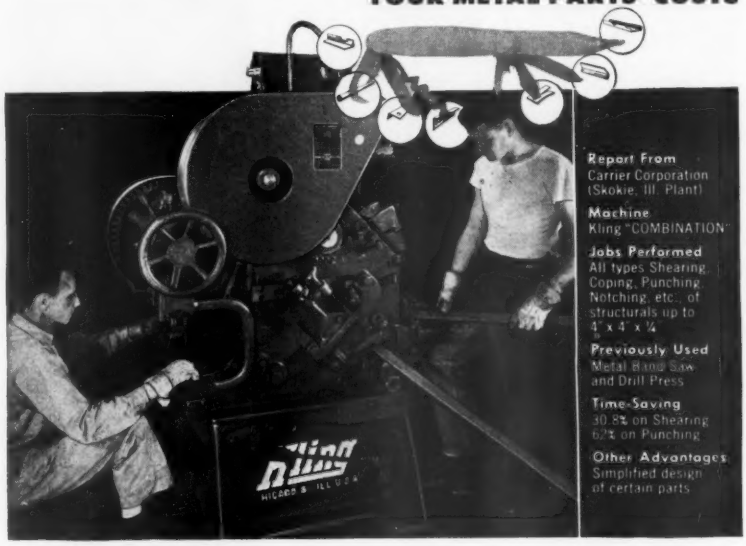
Automatic Chucking Machines. The 5D-2-9", 5D-2-12" and the 5D-2-15" Power-Flex automatic chucking machines are two-spindle models with, among other things, great rigidity and four automatic changes of spindle speed while under cut. An illustrated brochure telling all is available from the Potter & Johnston Co., Pawtucket, R. I.
Circle Inform-A-Gram No. B1.

Metal Cutting Saw Blades. Milford flexible back metal cutting band saw blades, profile saws and skip-tooth saws are made from a high carbon steel with fine grain structure. An illustrated catalog, No. 103-54, covers these products in detail. It is yours for the asking from The Henry G. Thompson & Son Co., New Haven 5, Conn.
Circle Inform-A-Gram No. B2.

You, too, can

"WHITTLE DOWN"

YOUR METAL PARTS' COSTS



the Kling COMBINATION SHEAR-PUNCH-COPER

is the "jack-of-all-jobs" IN THE "BEST OF COMPANIES!"*

It's as "all-round" useful as your boyhood jackknife. For example, at least eight different operations are performed by this Kling Combination Machine in one of the plants of a nationally famous manufacturer of air-conditioning equipment, according to their report. In addition to time-savings of 30.8 to 62%, this "all-round" machine makes possible much simpler designing of important parts. For maximum speed and safety, each end operates independently. Available in 3 sizes, for light, medium and heavy work. Ruggedly built for dependable performance over many years of multiple service.

* The following are some of the companies using Kling Machines:
Allis-Chalmers Mfg. Co. Auto Specialties Mfg. Co.
Bethlehem Steel Co. Inc. Carrier Corporation Grand Iron Works Inc.
Commercial Tank and Welding Co. L. B. Foster Co. Kylo and Co.
Link-Belt Co. Vincennes Steel Corp. Wabash Railroad Co.

For detailed description of the Kling "Combination" and all the jobs it can handle, send for new Bulletin 347.

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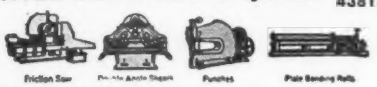
Since 1892 Kling ...an investment in speed! 438TP



CIRCLE INFORM-A-GRAM KEY NO. 901

Cast Aluminum Plates & Bars are covered in a booklet available from Pioneer Tool Engineering, Inc., 1601 East El Segundo Blvd., El Segundo, Calif. The literature deals with Pioneer Formula 921-T cast aluminum plates and bars. It tells how this material can be easily sawed, tapped, milled or welded and allows speed up to 6,000 fpm in turning, milling and drilling.
Circle Inform-A-Gram No. B3.

Die Grades. Latest carbide grades developed to give dies outstanding performance on a wide range of applications, are discussed in Kennametal's "Die Grades" booklet. Two applications featured in the literature are a Kennametal K84 mandrel used for cold drawing seamless steel tubing and a K92 lamination die. Bulletin B-100 can be had from Kennametal, Inc., Latrobe, Pa.
Circle Inform-A-Gram No. B4.

The "61" Universal Backstand Idler, a new, low cost attachment for all types of wall, bench and floor coated abrasive backstand grinding and polishing operations, is announced by the Coated Products Div., The Carborundum Co., Niagara Falls, N. Y. A brochure describing the idler completely is available from the company.
Circle Inform-A-Gram No. B5.

A New Reversible Clamp Assembly has been added to the line of standard jig and fixture components of the Jergens Tool Specialty Co., 712 E. 163 St., Cleveland, Ohio. The assembly designed for use in holding down work to be drilled or milled, operates with either left or right hand swing by optional location of the stock to be drilled or milled. Made in three sizes, the clamp assembly can be easily applied by drilling and tapping just one hole.
Circle Inform-A-Gram No. B6.

Central Filtration. A new bulletin presents a special report of a Delpark central filtration installation at Warner & Swasey's New Philadelphia, Ohio plant. Photographs show typical machines served by central filtration, machine bays, central filters, supply lines and coolant trenches. Advantages of time and labor saved, greater machine efficiency and extended tool and coolant life are covered in the report. The bulletin can be had from the Industrial Filtration Co., Dept. W-299, Lebanon, Ind.
Circle Inform-A-Gram No. B7.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Metal Stampings in Small Lots. This publication illustrates typical examples of parts manufactured by the Dayton Rogers Co., Minneapolis 7, Minn. Included is cost data and some quick facts regarding Dayton Rogers capacity and material stocks.
Circle Inform-A-Gram No. B8.

Strip Feed Press. The new No. 401 Hamilton strip feed press for high speed production of can ends, screw caps, and other light stampings is presented in a new bulletin (No. 1352) by Baldwin-Lima-Hamilton Corp., Hamilton, Ohio. Design, operation and specifications are given.
Circle Inform-A-Gram No. B9.

Iron Castings. Facilities for producing "Amercast" products in ductile iron, gray iron, alloy iron and semi-steel, from small sizes poured in large quantities on a rapid production basis to large castings up to 25,000 lbs., poured individually, are pictured and described in a new bulletin issued by American Cast Products, Inc., Orrville, Ohio.
Circle Inform-A-Gram No. B10.

A Portable Surface Resistance Analyzer for accurate measuring of aluminum interfacial sheet to sheet resistance in connection with resistance welding, is a new product developed by Chemical Research Associates, 333 N. Michigan Ave., Dept. 47, Chicago 1, Ill. Applications, operation details, description and specifications of the analyzer are contained in a bulletin now available.
Circle Inform-A-Gram No. B11.

Special Surface-Broaching installations of the "Ram-Press" broaching machine line are featured in a new bulletin just released by the Colonial Broach Co., P. O. Box 37, Harper Station, Detroit 13, Mich. Automatic and semi-automatic fixtures, hydraulic clamping and multiple broach set-ups are illustrated in working sequences to show load and unload positions.
Circle Inform-A-Gram No. B12.

For Paint Booth Operators. "Nine Specialized Booth Maintenance Products" is the title of a new pamphlet being offered to paint booth operators by Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif. The booklet (A-107) covers masking, deflocculating and stripping, and includes useful charts which indicate features offered by the various paint booth maintenance products.
Circle Inform-A-Gram No. B13.

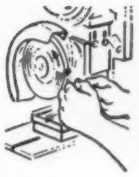
Drill Jig Vise. A new production time saver is the drill jig vise with a "Swing Away" top plate which can be moved completely out of the way, thereby permitting faster loading and easier nesting among other things. An illustrated brochure which ably describes this new tool, is available from the Accurate Bushing Co., Garwood, N. J.
Circle Inform-A-Gram No. B14.

Ring Gages. A new, low cost ring gage called "Boremaster," which is designed especially for setting dial bore gages and other types of inside measuring devices, is described in a brochure offered by the Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill. The literature also shows many reversible plain and thread plug gages.
Circle Inform-A-Gram No. B15.

Have You Tried a NORBIDE® Dressing Stick?

Just a couple of passes with a NORBIDE Dressing Stick . . . that's all it takes to . . .

Clean up a wheel face



Form a radius or groove

Touch up a cup or saucer

A NORBIDE Dressing Stick of Boron Carbide—the hardest man-made material—will outlast hundreds of ordinary dressing sticks.

With this light, handy stick you can see more of the wheel and thus avoid costly overdressing. You'll find it will greatly reduce dressing dust nuisance also.

Order a supply of these cost-cutting sticks from your local Norton distributor, or write for Form 1567 giving more details.

NORTON COMPANY, 47 New Bond Street, Worcester 6, Mass.

NORTON® BORON CARBIDE

Next to the diamond in hardness— available at a fraction of diamond cost

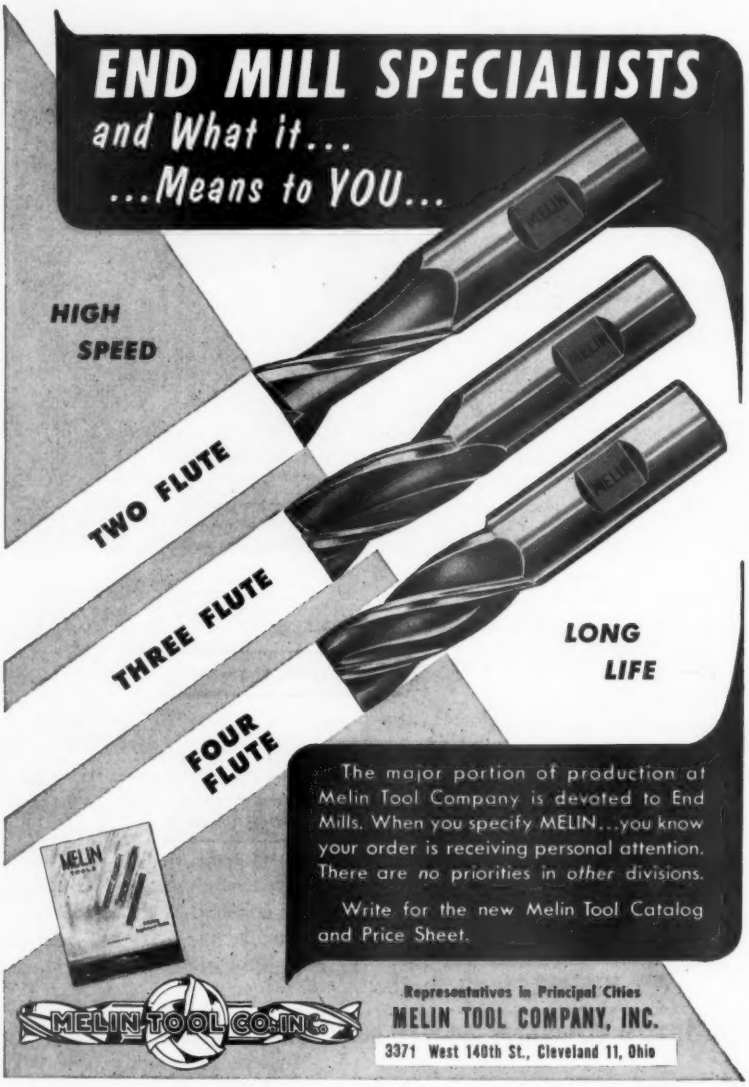
CIRCLE INFORM-A-GRAM KEY NO. 911

An All Hydraulic Lathe Copying Attachment is illustrated and described in a bulletin available from the Acc-U-Mat Machine Co., 40 Exchange Place, New York 5, N. Y.
Circle Inform-A-Gram No. B16.

Gear Lapping Problems and their solutions are discussed in a bulletin offered by the Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Also, two external and two internal gear lapping machines are illustrated, and their features, specifications and capacities are described.
Circle Inform-A-Gram No. B17.

Drafting Room Equipment. Prices, dimensions and specifications on all types of drafting equipment and aids are contained in Catalog 8A being offered by Mayline Co., Inc., Sheboygan, Wis.
Circle Inform-A-Gram No. B18.

Latrobe's Free Machining high production die steel reduces machining time as much as 50%. A folder available from Latrobe Steel Co., Latrobe, Pa., gives all the pertinent facts about this desegatized, air hardening, high carbon, high chromium die steel.
Circle Inform-A-Gram No. B19.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and What it...
...Means to YOU...
HIGH SPEED
TWO FLUTE
THREE FLUTE
FOUR FLUTE
LONG LIFE
The major portion of production at Melin Tool Company is devoted to End Mills. When you specify MELIN...you know your order is receiving personal attention. There are no priorities in other divisions.
Write for the new Melin Tool Catalog and Price Sheet.
MELIN TOOL CO. INC.
Representatives in Principal Cities
MELIN TOOL COMPANY, INC.
3371 West 140th St., Cleveland 11, Ohio
CIRCLE INFORM-A-GRAM KEY NO. 921

Gaging Policy. A simplified approach to the complex subjects of gage specification, tolerance, wear allowances, and control is offered in a booklet published as a service to industry by the Sheffield Corp., Dayton 1, Ohio. In this manual, Sheffield discusses its "Dimensional Control and Gaging Policy."
Circle Inform-A-Gram No. B20.

O.B.I. Presses. Why Clearing presses produce more is explained in a new O.B.I. Press catalog available from the Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill. This illustrated Bulletin 227 contains detailed data on the various parts which make the Clearing press a more versatile machine.
Circle Inform-A-Gram No. B21.

Hydraulic Metalworking Equipment, designed for lower costs and built to specifications, is described in a bulletin available from Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. Cutaway views in the literature show the unique, completely hydraulic action of the basic power cylinder of Danly hydraulic metalworking equipment.
Circle Inform-A-Gram No. B22.

Electronic Gaging Equipment. A technical bulletin on the measuring system used in electronic dimensional gaging equipment is available from the Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio. Bulletin 541 includes a block diagram that shows the principal parts of the gage head and low-frequency amplifier which comprises the measuring circuit.
Circle Inform-A-Gram No. B23.

Cyclo-Monitors... Bulletin 202-1 and 203 describes the basic elements of cyclo-monitors. These unusual controls count revolutions, strokes or electric impulses; transfer a switch when a pre-set count is reached and return the switch to its normal position. The bulletin is available from the Counter and Control Corp., 5225 W. Electric Ave., Milwaukee 14, Wis.
Circle Inform-A-Gram No. B24.

Precision Measuring Tools. The George Scherr Co., 200 Lafayette St., New York 12, N. Y. has issued a supplement to its literature on Mauser precision measuring tools. The new addition illustrates and describes an entirely new model of toolmakers vernier calipers with a combination of automatic camlock and fine adjustment screw, with long Vernier and full 6" measuring capacity. Other items shown are needle-point Vernier depth gages, knife-edge straight edges and hardened steel squares both straight and bevelled.
Circle Inform-A-Gram No. B25.

Leaf Taper Gages are for keeping track of hole sizes as you bore or grind. For detailed information and specifications on these gages, write to Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn., for the "Moore Direct Reading Leaf Taper Gages" catalog, or—
Circle Inform-A-Gram No. B26.

Vises & Rotary Tables are the topic of discussion in Catalog No. 201, which can be had from the Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill.
Circle Inform-A-Gram No. B27.

Plastic Steel. For making durable and permanent drill fixtures and jigs, forming and drawing dies, holding devices, models and many other types of industrial equipment, a combination of fine steel powder and a special plastic has been developed into a product called, "Devcon," which is as easy to handle as modeling clay. After the desired shape is formed, Devcon becomes an extremely strong, tough and rigid metallic piece in approximately 2 hours of hardening time. Detailed information on this plastic steel, including its many applications, are contained in a bulletin offered by the Chemical Development Corp., Danvers, Mass.
Circle Inform-A-Gram No. B28.

Air Power Catalog. Manufacturers seeking cheaper, faster production through use of air power will appreciate the contents of the new 52-page Industrial Air Power Catalog just issued by the Mead Specialties Co., Catalog Dept. 93-4114 N. Knox Ave., Chicago 41, Ill. Many new products, suitable for use in building automatic or semi-automatic production machines are listed in this booklet for the first time. In addition, each Mead product catalogued is pictured and shown in detail through a schematic drawing.
Circle Inform-A-Gram No. B29.

For the Carbide Tool Processor, Airless blast cleaning equipment is covered in Bulletin No. 215 offered by the American Wheelabrator & Equipment Corp., 1183 S. Byrkit St., Mishawaka, Ind.
Circle Inform-A-Gram No. B30.

Power Cutter. For plate and sheet metal work, a new power cutter has been developed that cuts, nibbles, slots, folds, etc. A bulletin, depicting eight of the power cutter's many applications, is available from the Nord International Corp., 449 Central Ave., Orange, N. J.
Circle Inform-A-Gram No. B31.

Complete Engineering Service offered by Barnes & Reinecke, Inc., 230 East Ohio St., Chicago 11, Ill., is described in this booklet. The primary function of the company is research and development engineering.
Circle Inform-A-Gram No. B32.

Production Tools. Ball-drive tool holders, turret tap holders, tappers, and tapping and drilling heads are just a few of the many production tools that are described in Catalog No. 54 put out by Errington Mechanical Laboratory, Inc., Staten Island 4, N. Y.
Circle Inform-A-Gram No. B33.

44% FASTER

NEW ROTOR D-4 GRINDER
pays for itself in one month

JOB: Grinding edges and holes of flame-cut tube hanger plates with 4" plug wheels.

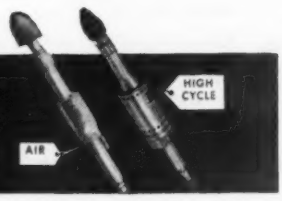
FORMERLY: Used 4500 rpm grinders. Output: 50 pieces per day.

NOW: Use new Rotor D-4 8500 rpm Grinders. Output: 72 pieces per day.

RESULTS: 44% more output paid off cost of new Rotor Grinders in one month. After that, it's pure savings.

Find out from your nearby Rotor Analyst how *you* can cut costs with the D-4 and other new Rotor portable tools! Ask for a demonstration.

ASK FOR BULLETIN NO. 43



THE ROTOR TOOL CO.
CLEVELAND OHIO

CIRCLE INFORM-A-GRAM KEY NO. 931

Gaging By Air. Reasons for using air instruments for gaging purposes, plus descriptions of numerous types of air gaging equipment are included in Catalog 613 published by the Taft-Peirce Mfg. Co., Woonsocket, R. I.
Circle Inform-A-Gram No. B34.

Carbide Tool Grinding Machine. The many features of a new carbide tool grinding machine, which permits wet grinding while providing full visibility of work, are featured in a bulletin offered by the Carbide Processors Supply Co., 1304 Harper Ave., Detroit 11, Mich.
Circle Inform-A-Gram No. B35.

Hole Punching. The evolution of modern hole punching and notching equipment is discussed in a booklet honoring the founder of the Wales-Strippit Corp., North Tonawanda, N. Y. Ask for "The Growth of an Idea . . . "
Circle Inform-A-Gram No. B36.

Control Instruments for furnaces, ovens, dryers and kilns are covered in Bulletin P1260 available from The Bristol Co., Waterbury 20, Conn. Some of the instruments listed are pyrometers, thermometers and control valves.
Circle Inform-A-Gram No. B37.

IT'S NEW! IT'S DIFFERENT! IT'S BETTER!

Eliminates Diamond Wheel Grinding

1. Tools can be micro finished on every cutting surface including the top which prevents hollowing or rounding of any cutting edge.
2. Table—designed and built so that all edges, including hooked tool edges, may be finished. Table extensions combined with quick, angular table settings read directly on a protractor, make finishing all edges a simple operation.
3. Immediate and positive finishing belt adjustment.
4. Positive V-Belt control through Jack-Screw adjustment automatically provides correct drive belt tension at all times.
5. Belt and pulley guard rigidly attached to machine.
6. Sealed ball bearing construction, dynamically balanced pulleys, rigid cast machine base.

WRITE FOR FULL INFORMATION

LEMPCO **LEMPCO PRODUCTS, Inc.**
Industrial Division
BEDFORD, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 941

Material-Handling. Bar racks, wire coil racks and special racks, designed for maximum efficiency in handling bars, tubing and structural material, are illustrated and described in a bulletin offered by the Jarke Mfg. Co., 5407 N. Broadway, Chicago 40, Ill.
Circle Inform-A-Gram No. B38.

Stock Straighteners, radius dressers and angle dressers are illustrated and described in literature available from Sperman Metal Specialties, 2199 E. 21st St., Brooklyn 29, N. Y. Features and hints for more efficient use of the products also are covered in the brochure.
Circle Inform-A-Gram No. B39.

Anti-Corrosion Coatings. Not all corrosion problems are identical; therefore, any single protective coating cannot be expected to provide the solution to all corrosion problems. To help determine the type of coating best suited to particular needs, Industrial Metal Protectives, Inc., 405 Homestead Ave., Dayton 8, Ohio, has published a comparison chart (Bull. Z-454) of its 12 Zincilate protective coatings.
Circle Inform-A-Gram No. B40.

Two-in-One Carbide Grinding Wheel. In answer to the expense problem associated with diamond abrasive wheels, the A.I.T. Diamond Tool Co., 646 West Lake St., Chicago 6, Ill., has come up with a one-machine, two-in-one wheel that can do four to five abrasive operations on carbide. When grinding wet, plunge grinding, shaping, hogging, and radiusing can be done with an A1-Aloid bonded wheel. In dry grinding, this wheel, resin-bonded, can be used for shaping and radiusing on the face section; and surface grinding and chip breaking on the O.D. section. An illustrated bulletin telling the complete story is available.
Circle Inform-A-Gram No. B41.

Toolholders. The new V-R Toolholder for "Throw-Away" blanks is available either with negative rake or neutral rake. Styles are available for triangular, square and round "Throw-Away" blanks. The toolholder is discussed in Toolholder Catalog VR-436, which can be had from the Vascoloy-Ramet Corp., Waukegan, Ill.
Circle Inform-A-Gram No. B42.

Gearless Drill Heads are among the products discussed in a publication entitled "Here Is What Zagar Tools Can Do for You," which is available from Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio. Other tools covered are self-clamping drill jigs, special drilling equipment and hydraulic broaching machines.
Circle Inform-A-Gram No. B43.

Internal Chucker. Typical applications, as well as unusual advantages of the Speedgrip Universal internal chuck, are described in an illustrated folder, which can be had from Speedgrip Chuck Div., Ernest, Holdeman & Collet, Inc., Elkhart, Ind.
Circle Inform-A-Gram No. B44.

Solenoid Valves. General descriptions, specifications, and mounting and outline dimensions of the new V9 series of small 4-way solenoid valves are contained in Bulletin No. 532 put out by the Skinner Electric Valve Div., The Skinner Chuck Co., New Britain, Conn.
Circle Inform-A-Gram No. B45.

Diaphragm Chucks are the topic for discussion in N.A. Woodworth's Catalog 49-C. The brochure shows the method of operation of these chucks, and with the aid of cut-away drawings shows how they work. The brochure can be had from the N.A. Woodworth Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.
Circle Inform-A-Gram No. B46.

Air Control. Better products, complete information and service are three important points covered in a new product folder published by the Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill. In the booklet is information on the firm's line of products for control, cleansing and lubrication of air.
Circle Inform-A-Gram No. B47.

Control Valves are covered in Bulletin 101B published by the Ross Operating Valve Co., 116 E. Golden Gate, Detroit 3, Mich. The booklet tells how Ross control valves work; models available; and their advantages. Illustrated and described are pilot-operated, remote-controlled, direct-operated, and miscellaneous and special valves.
Circle Inform-A-Gram No. B48.

Flow Control Valves. "Microfeed" flow control valves for machine tool and welding machine oil hydraulic systems are discussed in a new bulletin (53-35) now available from Vickers, Inc., 1400 Oakman Blvd., Detroit 32, Mich. Flow control circuits, performance curves, installation data and complete specification tables are given in the bulletin.
Circle Inform-A-Gram No. B49.

Air-Powered Hydraulic Drill Unit. Controlled power for drilling, reaming, centering, spot-facing, hollow milling and many other operations can be had with the Delta air-powered hydraulic drill unit. The Delta Power Tool Div., Rockwell Mfg. Co., 400 Lexington Ave., Pittsburgh 8, Pa., describes this versatile drill unit in Catalog AD-789 now available.
Circle Inform-A-Gram No. B50.

Precision Pin Gages, designed to determine quickly and accurately size and location of holes to tolerances of +0.0001" —0.0000", are illustrated and described in a catalog offered by The Horberg Gage Co., 23 Staples St., Bridgeport, Conn.
Circle Inform-A-Gram No. B51.

A New Grinder-Miller, with speed, power, durability and precision, is discussed in Bulletin C30, which is available from the Precise Products Corp., 1328-30 Clark St., Racine 1, Wis. Specifications and applications are included.
Circle Inform-A-Gram No. B52.

Air Compressors. The WN-114 "Package-Type" industrial compressors can be installed in a matter of hours because they are delivered complete and ready to run. The compact compressors, which are available in single or twin units with displacement capacities ranging from 1186 to 3896 cfm at pressures up to 125 psi, are delivered in single, integral, pre-aligned units. A bulletin presenting a graphic analysis of these compressors and including specifications and diagrams, can be had from the Joy Manufacturing Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Circle Inform-A-Gram No. B53.

COMBINED OPERATIONS...
CUT COSTS..
MOHAWK
SUBLAND
DRILLS

2 to 11 Operations
Simultaneously Accomplished

The Subland Drill Chamfer will cut production costs in your plant by performing both operations at one time. Overlapping cutting edges found only in Sublands provide up to 20 times as many resharpenings and eliminate all possibility of burr in the hole.
Center distances and diameters are held to closer tolerances because the Subland is a precision-built tool, manufactured between centers to assure absolute concentricity. Properly applied, a Subland can accomplish two to eleven operations at one time. Send part, print, tool layout, shank and over-all length requirements for prints and prices. Let Mohawk cut your production costs with properly applied Sublands.

. . . . 2
. . . . 1

SUBLAND DRILL (2-2) which will (1) drill and (2) chamfer a cavity in one operation.

SEE AUGUST ISSUE FOR NEW CONCEPTION OF SUBLANDS

Mohawk TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO
worlds largest producer of Sublands

CIRCLE INFORM-A-GRAM KEY NO. 951

Air Chucks for increased production, precision adjustment and standardizing work-holding equipment are covered in Bulletin AC-454 available from The Whiton Machine Co., New London, Conn.
Circle Inform-A-Gram No. B54.

Reduced Gage Obsolescence is one advantage offered by adjustable dial indicator type gages for large diameters and for length measurements. Adjustable Setmasters are also illustrated and described in Bulletin 454 just released by Boice Mfg. Co., Inc., Staatsburg, N.Y.
Circle Inform-A-Gram No. B55.

Diamond Wheels. Data on the use of diamond wheels, plus the various types of wheels, is contained in a diamond wheel handbook, available from the Bay State Abrasive Products Co., Westboro, Mass.
Circle Inform-A-Gram No. B56.

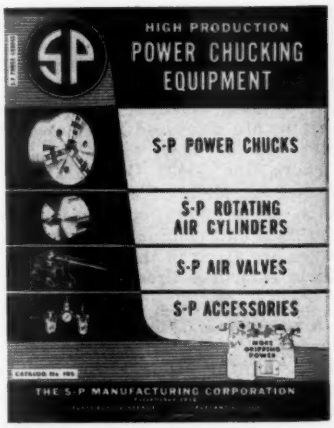
Double-Acting Pneumatic Cylinders designed for limited-space requirements are illustrated and described in Catalog 9308-2 published by the Industrial Products Div., Westinghouse Air Brake Co., Wilmerding, Pa. Included are specifications and dimensions.
Circle Inform-A-Gram No. B57.

Air Cylinders. Engineering data and mounting instructions are contained in Bull. A-105G on air cylinders issued by the Miller Fluid Power Co., 2040 N. Hawthorne Ave., Melrose Park, Ill.
Circle Inform-A-Gram No. B58.

Plug-In Units. Manufacturing and assembly of many electronic products are simplified with the new EECo multi-diode plug-in units which allow all diodes in a circuit to be replaced simultaneously. Catalog C-3 containing complete details and specifications is available from the Electronic Engineering Co. of California, 180 S. Alvarado St., Los Angeles 57, Calif.
Circle Inform-A-Gram No. B59.

A Power Unit folder containing engineering data and describing Ex-Cell-O's quill type hydraulic units, Styles 22 and 22-L, is now available. These units are used for advancing, feeding and retracting the cutting tools on special machines, have 3 hp capacity and strokes of 8" and 12" respectively. Copies of the folder can be had from the Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. If writing direct to the company, ask for Bulletin 45040.
Circle Inform-A-Gram No. B60.

Petch Cylinders. A 32-page catalog that gives specifications and engineering data regarding air and both high and low pressure hydraulic cylinders has been released by the Petch Mfg. Co., 463 York, Detroit 2, Mich. The air and low pressure hydraulic cylinders range in size from 1½" to 10" bore and the high pressure hydraulic from 1½" to 6".
Circle Inform-A-Gram No. B61.



High Production Power Chucking Equipment is covered in an attractive, illustrated 32-page catalog (No. 105) just released by the S-P Mfg. Co., 12415 Euclid Ave., Cleveland 6, Ohio.
Circle Inform-A-Gram No. B62.

When you "SAVE"...
YOU LOSE!
"Saving" by making your own punches is old-fashioned and expensive.
Here's why:
1. PORTER PUNCHES are available for immediate delivery.
..... they save time — money — by keeping your expensive help at profitable jobs.
2. PORTER PUNCHES are made to "stand the gaff."
..... punches made in your shop are probably made from "available" material ... often the wrong metal for the job.
3. PORTER PUNCHES are offered in standard—and decimal sizes.
..... so your experienced help doesn't spend costly time "whittling."
4. PORTER PUNCHES are reasonably priced.
..... only a "specialist" can make punches as well—or as inexpensively.
Check your labor costs — your "down-time"— and order
PORTER PUNCHES
— for immediate delivery.
Save time — save money — with top quality punches and die buttons.
Look to Porter for
the punch you need... when you need it!
Remember — you don't save by making your own punches — you lose.
"Still the best performer"
PORTER PRECISION PRODUCTS
Cincinnati 15, Ohio
Porter Punches are in stock in all principal cities.
CIRCLE INFORM-A-GRAM KEY NO. 961

Heavy Duty Engine Lathes are illustrated and described in Bulletin No. 70, which can be had from the Boye & Emmes Machine Tool Co., 81 Caldwell Dr., Hartwell, Cincinnati 16, Ohio.
Circle Inform-A-Gram No. B63.

Spectrography. A 20-page catalog on Hilger equipment for Raman Spectrography has been published by the Hilger Div., Hilger & Watts, Ltd., London. Copies of Catalog CH334/2 are available to TOOLING and PRODUCTION readers who are interested in analytical instrumentation and related problems through the Jarrell-Ash Co., 26 Farwell St., Newtonville, Mass.
Circle Inform-A-Gram No. B64.

Heavy Duty Turret Lathes with many new design features and improvements are described in illustrated literature (Bull. 5404) that is yours for the asking from the Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio. Among the many improvements are added horsepower, revised ranges of 16 instantly changeable speeds, and extreme indexing accuracy.
Circle Inform-A-Gram No. B65.

Profile Tracing Attachments for engine or turret lathes are described in an illustrated bulletin that Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa., wishes to pass on to TOOLING and PRODUCTION READERS. The brochure gives a detailed account on how the Lehigh Rotary Stylus with positive wedge lock is designed to speed production and assure accuracy in high production duplicating work.
Circle Inform-A-Gram No. B66.

Nullmatic Pressure Regulators are pilot-operated instruments, operating on a pneumatic "null"-balance system and providing controlled output pressures which are practically independent of variations in flow and in supply pressure. Schematic drawings and graphs are included in Bull. 4003 offered by the Moore Products Co., H & Lycoming St., Philadelphia 24, Pa.
Circle Inform-A-Gram No. B67.

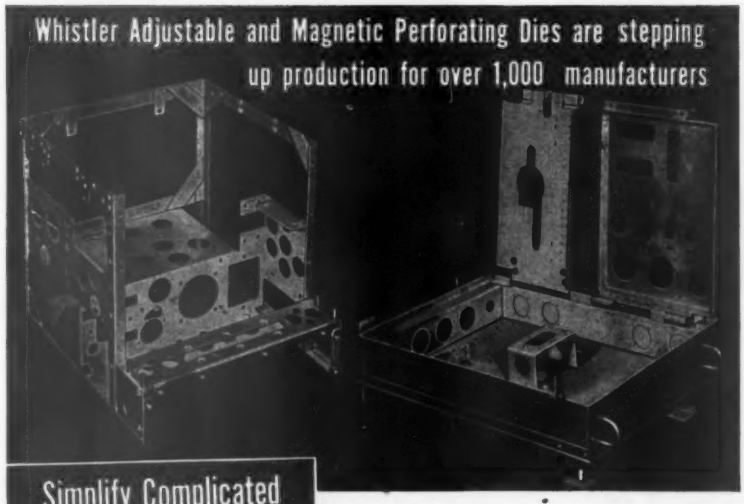
Indexing Table. A new folder describing the Erickson line of speed indexers in now available. The literature covers the Model No. 450 rotary index table which is designed for use in a vertical position where limited height is a factor. Also described are Models 400 and 600 speed indexers that are recommended for milling, drilling, tapping, spot welding or any other assembly where regular spacing is required. Copies of the folder are available from the Erickson Tool Co., 23rd & Hamilton Ave., Cleveland 14, Ohio.
Circle Inform-A-Gram No. B68.

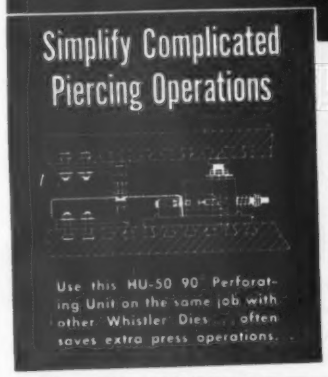
Air & Hydraulic Components such as cylinders, pumps, power units, valves, motors and accessories, are illustrated and described in Catalog No. 1101 published by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.
Circle Inform-A-Gram No. B69.

Air Powered Screw Drivers by Ingersoll-Rand are available in three basic series. Both reversible and non-reversible models can be had. The extreme versatility of these screw drivers is indicated by tables included in a brochure (Form 5056A) released by the Ingersoll-Rand Co., Phillipsburg, N.J.
Circle Inform-A-Gram No. B70.

Wheel Dresser. For accurate angle tangent to radius wheel dressing, The Last Word Sales Co., 18500 Mt. Elliott, Detroit 34, Mich., presents a complete new line of wheel dressers. The tools are illustrated and described in literature now available.
Circle Inform-A-Gram No. B71.

Air & Hydraulic Cylinders. A new bulletin (No. 800), which covers the standard line of heavy duty air and hydraulic cylinders, is available from the Air and Hydraulic Division of the Lindberg Engineering Co., 225 N. Laflin St., Chicago 7, Ill.
Circle Inform-A-Gram No. B72.




Simplify Complicated Piercing Operations
Use this HU-50 90° Perforating Unit on the same job with other Whistler Dies . . . often saves extra press operations.

USE WHISTLER Adjustable and Magnetic Dies for perforating, notching and slotting sheet metals... fast, accurate and cost cutting. Complicated patterns can be set up quickly. Hole arrangements can be changed in the press... without waiting and at no extra die cost. New HU-50 units, that pierce at 90° angle, can be used in conjunction with standard perforating equipment. Fewer press operations are necessary.

Re-use the same dies in different arrangements on many jobs. Punches and dies are interchangeable.

Whistler Adjustable Dies can be used in practically every type press. Standard sizes and shapes of punches and dies available up to 3 inches. Special sizes and shapes to order.

S. B. WHISTLER & SONS, Inc.

748 Military Road
Buffalo 23, New York

For prices and application data on this modern way to speed production and cut unit costs, write for these illustrated Whistler catalogs.

For your convenience **Whistler direct factory representatives are located in most principal cities. Their on-the-job application experience, combined with Whistler's 35 years experience in the manufacture of tools and dies, is available on request.**

CIRCLE INFORM-A-GRAM KEY NO. 971

Power Cells & Pull Guns for driving Huckbolts and blind rivets are described in a bulletin issued by the Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich.
Circle Inform-A-Gram No. B73.

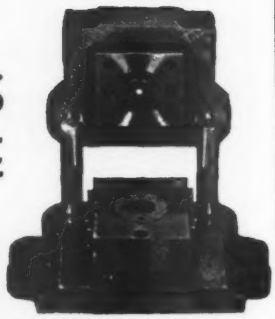
Pneumatic Grinder. The M-B Junior pneumatic hand grinder, component parts and accessories are described in literature now available from M-B Products Co., 46 Victor Ave., Detroit 3, Mich. Bulletin 1005-A includes data on the M-B automatic air line filter, regulator and lubricator assembly.
Circle Inform-A-Gram No. B74.

Carbide Tools, special single point and flat forms, are covered in a bulletin available from the Carbide Tool Co., 1304 Harper Ave., Detroit 11, Mich.
Circle Inform-A-Gram No. B75.

Roller Bearing Pilot Bushings — for extreme machining accuracy and extended tool life — are illustrated and described in a bulletin available from the J. G. Jergens Co., 11106 Avon Ave., Cleveland 5, Ohio. These bushings last longer due to the absolute seal of the bearing against coolant and abrasive dust.
Circle Inform-A-Gram No. B76.

"A MUST wherever WASHERS are made!"

HOVIS OFFERS YOU THIS SIMPLE, UP-TO-THE MINUTE METHOD



There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.

Made in 5 sizes:
¾"—1½"—2½"—4"—6"

Write for literature.

HOVIS SCREWLOCK COMPANY
8100 E. NINE MILE ROAD VAN DYKE, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit
CIRCLE INFORM-A-GRAM KEY NO. 981

Air Tools. The complete line of air tools manufactured by the Aro Equipment Corp., Bryan, Ohio, is covered in the 74-page Catalog 61 now being distributed by the company. All told, more than 40 air tools — grinders, sanders, polishers, drills, nutsetters, and others — are covered in the brochure.
Circle Inform-A-Gram No. B77.

Surface Grinder. Pratt & Whitney's Model "D" 14" hydraulic surface grinder has added power, heavy construction, extra stability and faster speeds. Illustrations and complete descriptive material, plus specifications are contained in a new brochure available from Pratt & Whitney, Division of Niles-Bement-Pond Co., W. Hartford 1, Conn.
Circle Inform-A-Gram No. B78.

Aritemp Plasti-Metal For Tooling. A new series of improved metal-containing resins for industrial tooling has been developed and is being offered by Aries Laboratories, Inc., 270 Park Ave., New York 17, N.Y. These plastics can simplify production techniques in aircraft, automotive, and foundry metal forming applications. Information and detailed data sheets are available.
Circle Inform-A-Gram No. B79.

Transmissions. A new magnetic brake and clutch bulletin (No. 226-C) has been released by Stearns Magnetic, Inc., Milwaukee 46, Wis. It provides a ready reference for figuring the right transmission equipment for individual applications and contains complete figures, diagrams, dimensions, capacities, horsepower and torque ratings of Stearns clutches, brakes and clutch-brake combinations.
Circle Inform-A-Gram No. B80.

Colloidal Graphite. Among a score of properties, which in combination make colloidal graphite unique, the two of conspicuous value in metalworking are its lubricating qualities and its resistance to heat. Bulletin 426, which summarizes the use and advantages of "dag" colloidal graphite dispersions in various metalworking operations, is available from the Acheson Colloids Co., Port Huron, Mich.
Circle Inform-A-Gram No. B81.

Cycle Controller. A timer to control the varied and complex cycles of automatically operated hydraulic presses is now on the market. It is a complete, simple and easily operated unit that requires no extra accessories. Pilot valves and micro switches may be interchanged for either all-pneumatic or all-electric timing. The Sinclair-Collins Valve Co., 454 Morgan Ave., Akron, Ohio describes this unit in a 24-page booklet.
Circle Inform-A-Gram No. B82.

Two-Dimensional Repro-Templates are the subject of a catalog announced by Repro-Templates, Inc., Oakmont, Allegheny County, Pa. The publication lists 10,000 stock items including all conventional machine tools, shop, office materials-handling equipment, etc., as well as grid sheets and accessory material now available.
Circle Inform-A-Gram No. B83.

Drill Jig. The John's drill jig — a versatile, self-centering work-holding device for precision, economical production — is illustrated and described in a folder now available. This unique jig is equally useful for drilling, milling, and tapping. The circular is published by the Heuser Mfg. Co., 1638 N. Paulina St., Chicago 22, Ill.
Circle Inform-A-Gram No. B84.

Hi-Duty Tapping Machines. Service proven air operated clutches are a distinctive feature of the Kaufman Hi-Duty tapping machines. The fast air-operated machines also feature lead screw control for accurate threads and maximum tool life, and automatic advance to work. Complete data is contained in Catalog 1153 put out by the Kaufman Mfg. Co., Manitowoc, Wis.
Circle Inform-A-Gram No. B85.

Swing Frame Grinder. Precision built for long service, a versatile swing frame grinder offered by the Curtis Machine Corp., 1300 E. Second St., Jamestown, N.Y., can be used in small, as well as large plants for a variety of operations. Features of this machine, plus other pertinent details are contained in an illustrated circular available from Curtis.
Circle Inform-A-Gram No. B86.

"Weld Grinding & Blending with 3M Abrasive", a new booklet describing the use of coated abrasive discs and belts for weld-removal, is available from the Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn. The literature gives detailed information on how users of coated abrasives find unit costs are reduced, production increased, and the quality of finish improved.
Circle Inform-A-Gram No. B87.

Air Gages. What's new in Federal air gages? Well, among other things, there's the 5000 to 1 magnification Dimensionair, which permits inspection of dimensions to the finest practical tolerances, and the AirProbe, a new spindle-like unit which lends itself to a wide range of special gaging applications. For information on other air gages, also, the Federal Products Corp., 1144 Eddy St., Providence, R. I., is offering TOOLING and PRODUCTION readers an illustrated catalog on "What's New in Federal Air Gages."
Circle Inform-A-Gram No. B88.

Powergrip Hydraulic Chucks that provide unusual safety for heavy stock removal at high spindle speeds, are discussed in a folder offered by the DeWitt Equipment Corp., 135 Lafayette St., New York 13, N.Y.
Circle Inform-A-Gram No. B89.

Internal Cutting Tools are displayed in Catalog No. 101, which is available from the R. B. Tool Co., Inc., 785 N. Broadway, White Plains, N.Y. Described are boring, facing and bottoming, threading, and recessing tools. Both high speed steel and solid carbide head types are included.
Circle Inform-A-Gram No. B90.

Swiss Pattern Files. A booklet showing a wide range of the most widely-used Swiss-Pattern files, and telling how to get the most out of these precision cutting instruments, is now available from the Heller Brothers Co., Newcomerstown, Ohio.
Circle Inform-A-Gram No. B91.

Special Machines & Dies. The experience, techniques, facilities, service and finished products of the special machine and die maker's skills are contained in Bulletin 201 offered by the Shepherd Special Machine & Die Co., 15215 Chatfield Ave., Cleveland 11, Ohio.
Circle Inform-A-Gram No. B92.

Photo courtesy Caterpillar Tractor Co.

LEHMANN Boring Bars used for rough and finish boring in these blocks for cylinder liners

Here's another manufacturer — Caterpillar Tractor Co., Peoria, Illinois — who use Lehmann Boring Tools for precision boring. The bars above, made by Lehmann, bore a block for cylinder liners used in Caterpillar's D 386 and D 397 Diesel Engines. The Lehmann bars rough and finish bore for a close tolerance fit of the liners.

This is another example of how Lehman's engineering and designing skill, put to work for special boring needs, can give accuracy and efficiency to the boring operations on your production line.

Depend on LEHMANN Boring Tool for . . .

- Top engineering experience — 35 years approved by industry.
- Skilled machinist experience to give efficient, accurate, precision tools every time.
- Help cut machinery time to a minimum and put utility and economy in your boring operations.
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DIVISION OF NOVO ENGINE CO.

CIRCLE INFORM-A-GRAM KEY NO. 991

"Multiform" Bender-Cutter. Hand or air operated bench machines for low-cost fabricating of small brackets, fixtures, bus bars, springs, machine parts, etc., are illustrated and described in literature available from the J. A. Richards Co., Kalamazoo, Mich.
Circle Inform-A-Gram No. B93.

Pressure Regulators. A new fixed-output pressure regulator, with large filter and dripwell, is especially designed to provide a clean, dry fixed pressure source of air at pressures
Circle Inform-A-Gram No. B94.

ranging from 2 to 100 psi. The unit is described in an illustrated bulletin available from the Kendall Controls Corp., 144 Moody St., Waltham 54, Mass.
Circle Inform-A-Gram No. B95.

Centralized Lubrication Systems are described in Catalog 80-1, which is available from the Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis 20, Mo. Besides depicting lubricant pumps, injectors and other equipment, this booklet also includes charts for the selection of equipment.
Circle Inform-A-Gram No. B96.

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844 Center Street Logansport, Indiana
CIRCLE INFORM-A-GRAM KEY NO. 1001

Spring Plungers & torque-type thumb screws are featured in Catalog No. 54 of the Vlier Engineering Corp., 4552 Beverly Blvd., Los Angeles 4, Calif. The catalog lists various other tooling specialties for jigs, fixtures and dies.
Circle Inform-A-Gram No. B97.

Air Control Valves. The diversatility of Air Control valves is the subject of an illustrated brochure put out by the Valvair Corp., 952 Beardsley Ave., Akron 11, Ohio. The literature covers the three basic Valvair bodies and includes exterior and cross sections views.
Circle Inform-A-Gram No. B98.

Automatic Screw Machine. A bulletin giving details on the new "Double-Matic" single spindle automatic screw machine is available from Porter-McLeod Machine Tool Co., Inc., Hatfield, Mass. The Double-Matic is a bar machine that also performs numerous second operations before work ejection.
Circle Inform-A-Gram No. B99.

Pneumatic Measuring Instruments, designed for fast but exacting dimensional measurements required for automatic machine control and for sorting of mass produced parts, are described in current literature released by the C. E. Johansson Gage Co., 10641 Haggerty Ave., Dearborn 1, Mich.
Circle Inform-A-Gram No. B100.

Second Operation Machines for high speed precision work are illustrated and described in Bulletin DSM 59 put out by Hardinge Brothers, Inc., Elmira, N.Y. By reviewing this publication, you can see for yourself the advantages of using second operation machine for second operation work.
Circle Inform-A-Gram No. B101.

Di-Profiler. For complete die filing, i.e., scraping, honing, milling, polishing, filing, sawing, lapping, grinding, and engraving, the Nord Di-Profiler is easily adapted to all quick needs. The many applications of this tool are shown in the Di-Profiler bulletin offered by the Nord International Corp., 449 Central Ave., Orange, N. J.
Circle Inform-A-Gram No. B102.

Cut-Off Wheels. A bulletin (No. 6750) on Manhattan cut-off wheels, issued by the Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N. J., includes recommendations with wheel grade numbers for a wide variety of materials. Valuable operating suggestions for improved and faster metal cutting and photos showing the wheels installed on various types of machines, are also included.
Circle Inform-A-Gram No. B103.

Friction Saws are featured in Bulletin 4200 which illustrates and describes the latest developments on the Horizontal Stroke Kling High Speed Saw. Write to Kling Bros. Engineering Works, 1320 N. Kostner Ave., Chicago, Ill., or—
Circle Inform-A-Gram No. B104.

Precision Screw Machine Products. Contract service, facilities, and typical parts machined are covered in a publication recently compiled by the Precision Products Division of The New Britain Machine Co., New Britain, Conn. Precision Products currently serves the various aircraft engine builders and other manufacturers of mechanical devices and metal products.
Circle Inform-A-Gram No. B105.

Finishing Forging Dies by the wet blasting process is explained in Bulletin 103 published by the American Wheelabrator & Equipment Corp., 1183 Byrkit St., Mishawaka, Ind. Titled "Finish Forging Dies in Minutes", it tells how wet blasting is done during manufacture of a forging die to remove burrs.
Circle Inform-A-Gram No. B106.

Ultrasonic Machine Tool. A new concept in cutting or shaping hard or brittle materials is presented in literature describing a new ultrasonic machine tool, which combines ultrasonic vibrational energy with controlled abrasive action. Applications and illustrations are contained in the bulletin describing the Model T 2525 machine. The literature can be had from the Raytheon Mfg. Co., Equipment Sales Div., Dept. 6253, Waltham 54, Mass.
Circle Inform-A-Gram No. B107.

Clutch-Coupling Units. This folder gives dimensional data, service factors, and other application engineering data on Formsprag clutch-coupling units. The literature can be had from the Formsprag Co., 23601 Hoover Rd., Van Dyke, Mich.
Circle Inform-A-Gram No. B108.

Dial Gages. Improved dial bore gages, bore gage Setmasters, dial snap gages, and snap gage Setmasters are illustrated and described in Bulletin 354 now available from Boice Mfg. Co., Inc., Staatsburg, N.Y.
Circle Inform-A-Gram No. B109.

Wheel Forming Attachment. The new Pratt & Whitney medium sized Diaform simplifies the form-truing of complex and irregular shapes up to 2" wide and 1" deep on any wheel from the smallest up to 14" diameter and insures the re-truing of a formed shape as often as required. Read all
Circle Inform-A-Gram No. B110.

about the Diaform in illustrated Circular No. 572 now available from Pratt & Whitney, Division of Niles-Bement-Pond Company, West Hartford 1, Conn.
Circle Inform-A-Gram No. B111.

Metal Stampings and washers (special sizes and shapes) are covered extensively in an illustrated brochure prepared by The Quadriga Mfg. Co., 213-233 W. Grand Ave., Chicago 10, Ill. Listed are the hundreds of sizes in which round blanks, flat and tension washers can be stamped on standard dies.
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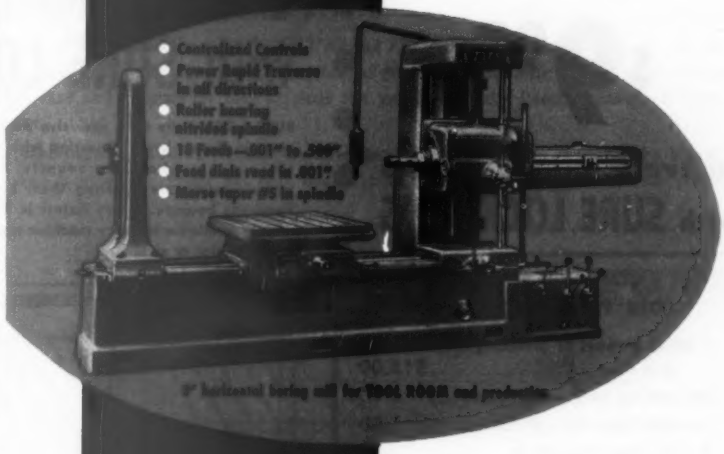

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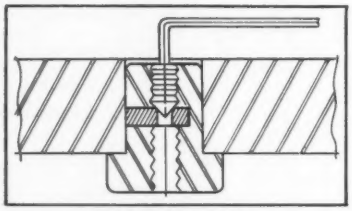

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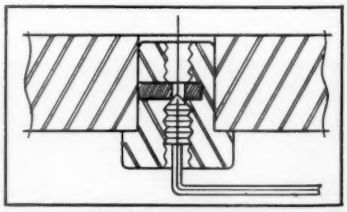

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4	18	32	78	931	1091	1192	1253	1302	1343	1370	1441	1471	1501
5	19	33	79	941	1101	1201	1254	1303	1351	1371	1442	1472	1502
6	20	34	801	951	1111	1202	1261	1304	1352	1381	1443	1473	1503
7	21	35	811	961	1141	1203	1262	1311	1353	1391	1444	1474	1504
8	22	38	821	971	1142	1211	1263	1312	1354	1401	1445	1475	1505
9	23	39	841	981	1151	1221	1271	1313	1361	1402	1446	1476	1506
10	24	40	842	991	1152	1222	1272	1314	1362	1411	1447	1481	1511
11	25	42	861	1001	1161	1223	1273	1321	1363	1412	1451	1482	1512
12	26	43	871	1011	1162	1231	1281	1322	1364	1413	1452	1483	1513
13	27	67	881	1021	1163	1241	1291	1323	1365	1414	1453	1484	1530
14	28	69	891	1051	1171	1242	1292	1324	1366	1431	1454	1491	1540

EDITORIAL ITEMS

A1	A15	A29	B5	B19	B33	B47	B61	B75	B89	B103	C5
A2	A16	A30	B6	B20	B34	B48	B62	B76	B90	B104	C6
A3	A17	A31	B7	B21	B35	B49	B63	B77	B91	B105	C7
A4	A18	A32	B8	B22	B36	B50	B64	B78	B92	B106	C8
A5	A19	A33	B9	B23	B37	B51	B65	B79	B93	B107	C9
A6	A20	A34	B10	B24	B38	B52	B66	B80	B94	B108	D1
A7	A21	A35	B11	B25	B39	B53	B67	B81	B95	B109	D2
A8	A22	A36	B12	B26	B40	B54	B68	B82	B96	B110	D3
A9	A23	A37	B13	B27	B41	B55	B69	B83	B97	B111	D4
A10	A24	A38	B14	B28	B42	B56	B70	B84	B98	B112	1975
A11	A25	B1	B15	B29	B43	B57	B71	B85	B99	C1	
A12	A26	B2	B16	B30	B44	B58	B72	B86	B100	C2	
A13	A27	B3	B17	B31	B45	B59	B73	B87	B101	C3	
A14	A28	B4	B18	B32	B46	B60	B74	B88	B102	C4	

Which article in this issue of *TOOLING and PRODUCTION* was the most interesting or valuable to you? _____

_____

These INFORM-A-GRAM cards are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

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A4	A18	A32	B8	B22	B36	B50	B64	B78	B92	B106	C8
A5	A19	A33	B9	B23	B37	B51	B65	B79	B93	B107	C9
A6	A20	A34	B10	B24	B38	B52	B66	B80	B94	B108	D1
A7	A21	A35	B11	B25	B39	B53	B67	B81	B95	B109	D2
A8	A22	A36	B12	B26	B40	B54	B68	B82	B96	B110	D3
A9	A23	A37	B13	B27	B41	B55	B69	B83	B97	B111	D4
A10	A24	A38	B14	B28	B42	B56	B70	B84	B98	B112	1975
A11	A25	B1	B15	B29	B43	B57	B71	B85	B99	C1	
A12	A26	B2	B16	B30	B44	B58	B72	B86	B100	C2	
A13	A27	B3	B17	B31	B45	B59	B73	B87	B101	C3	
A14	A28	B4	B18	B32	B46	B60	B74	B88	B102	C4	

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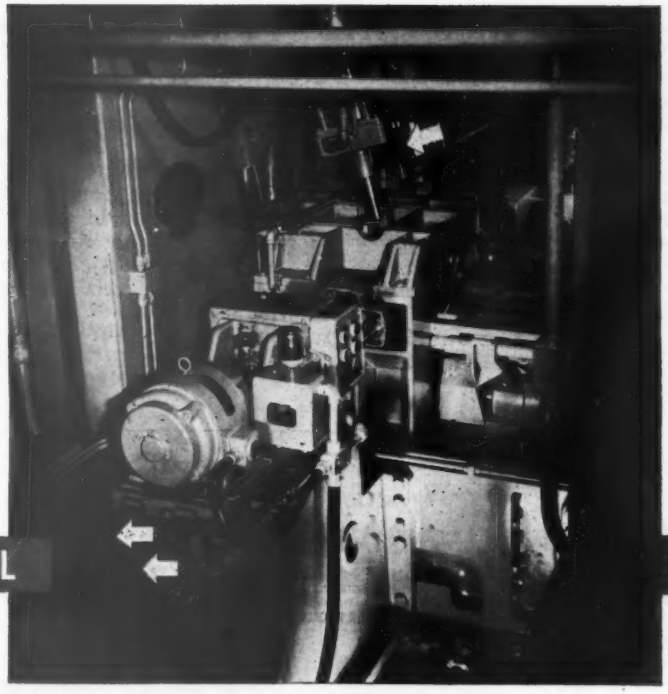
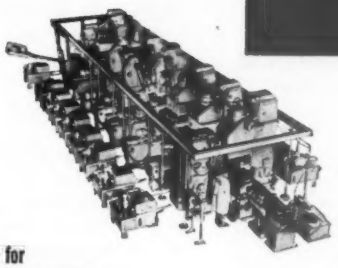
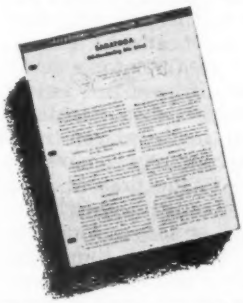




Ludlum Saratoga was used for the steel ways (note arrows, above) of this giant unit, illustrated at left in a bird's-eye view reduced to miniature size.

Write for BLUE SHEET ON SARATOGA



This concise four-page folder gives all needed handling and shop treatment details on Saratoga. Included is certified laboratory information on physical characteristics, and complete data on forging, annealing, hardening, tempering, etc. *Ask for your copy.*

Address Dept. P-55

98 SEPARATE OPERATIONS are carried on by this versatile machine which turns out 50 V8 auto engine blocks an hour. It consists of 18 machining units, each of which is fitted with hardened and ground steel ways of Ludlum Saratoga to guarantee accuracy in production.

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ALLEGHENY LUDLUM METALLURGICAL SERVICE can solve *your* tool or die steel problems. ● Call your local A-L representative or distributor today, or write *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pennsylvania.*

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WAD 5155

AL® FINE TOOL STEELS SINCE 1854

CIRCLE INFORM-A-GRAM KEY NO. 1051

JUNE GRADUATES - - PROFIT OR LOSS FOR INDUSTRY

"About 1½ million young people graduated from high schools and colleges last month" reports Industrial Psychology, Inc., nationally-known research organization. "Job placement of these inexperienced students will be difficult for the simple reason that, present experience shows, four out of 10 of these youngsters will land in the wrong job or otherwise washout in the first year on the job—leaving their employers with a staggering loss in dollars and worthless training."

Some indication of the significant bill that industry pays for the unscientific selection of new workers is provided in a study reported upon by the American Management Association. The study, which analyzed the job performance of 1,167 college graduates hired by 247 companies, disclosed that 42% proved unsatisfactory, or left their jobs before the end of their first year. The relatively few companies surveyed lost an estimated $1,347,500 in these first-job washouts. When high school graduates are also considered, and for industry as a whole, this "washout bill" runs into many millions every year.

What can management do in this problem of "first-job washouts"? Here are three broad areas in which action can be taken, not only to increase company efficiency in first-job employees, but also to minimize loss of morale and self-confidence in the graduate on his first job:—

1. Use appropriate selection and placement methods. The application blank and interview should be used in the screening of the first-job applicant. However, it is obvious that, with no employment history, application blank data and even the interview will yield very little information of value. Job-tests are thus a "must." Job-tests measure aptitudes, and aptitudes indicate the potential to learn and perform a certain job assignment. The job-test provides a score which is expressed as a qualification level based on national standards. The applicant can be tested for one job area (i.e., if he has had vocational training in a certain area), or for a series of job areas. If he scores as underqualified for a particular job area and he is placed in that area, the company is merely contributing to the present statistic that the average high-school student loses or leaves four jobs in his first year of full-time employment. This represents an investment by each of four companies in the community of $300.00 per individual for his first year. It also represents a great deal of frustration for the individual.

2. Make proper follow-up of student new-hire. It is most important with the new-hire on his first full-time job to watch him very carefully, and to see that he does not develop feelings of insecurity, job frustrations, lack of recognition and status, etc. Standard personnel techniques used for such follow-ups include: orientation to the company and the job, vestibule and on-the-job training, follow-up counseling

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FAST—ACCURATE—ECONOMICAL—DRY CUTTING

Capacity up to 8" round

Improved MARVEL No. 2 DRAW CUT HACK SAW MACHINE

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See your Dealer. If he does not stock MARVEL Saws, he can get them quickly. Or simply write us for literature and delivery. When buying hack saw blades insist that your dealer furnishes genuine MARVEL High-Speed-Edge Hack Saw Blades—they are unbreakable!

Fast... because the simple, rugged construction permits the use of high speed steel blades.

Accurate... because the improved Saw Frame with clamping type blade holders holds the blade in perfect alignment and proper tension.

Economical... because of its automatic relief on the return stroke, the blade will last and last and last.

Dry Cutting... because modern high speed steel blades will operate efficiently at 60 strokes per minute without a coolant.

MARVEL Metal Cutting SAWS

Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 Bloomingdale Ave. • CHICAGO 39, ILL

CIRCLE INFORM-A-GRAM KEY NO. 1061

interview after one month on the job, periodic morale surveys, merit rating program with particular stress on the supervisor's review with each employee of his progress every six months.

3. Use vocational guidance information available from schools. Many high schools and colleges operate vocational guidance programs, and have available information concerning the student's job qualifications. Such programs are extremely valuable in that they orient the student for entry into business and industry, and help guide him into the proper job area. Job-tests have been administered in the student's junior or senior year, and scores are available on his qualification levels and aptitude strengths and weaknesses for various job areas. Companies in communities where the school system has such a program should take advantage of this information, and obtain for their student applicants the test score information from the school.

Application of Vapor Blast

Following proven economies in production finishing of parts for the J-57 jet engine, the Ford Aircraft Engine Division at Chicago has set up a Vapor Blast—Roto Finish department. The new department has the full time assignment of mass producing the specified surface finishes necessary in precisely built power plants for military aircraft.

One of the jobs that has established the value of the new finishing method supplied by vapor blasting was an 80% reduction in the time required to finish an aluminum diffuser. Originally it took 11 hours to develop the specified finish. With the introduction of 17 minutes of vapor blasting, the job was immediately cut to 2 hours, an overall saving of 8 hours, 43 minutes. Since then the vapor blasting time has been reduced from the original 17 down to 5 minutes, according to William Yeoman and E. R. Kopcinski, supervisors of the section.

The Ford production men are applying the vapor blast liquid honing process to produce a metallurgically clean surface prior to plating, polishing, lapping or other coating processes. It is also used to remove machining or directional polish lines, etc.

In addition, the liquid honing process is applied to produce a controlled and wettable surface to retain lubricants uniformly. The process also removes fine burrs on metals and alloys, resulting in a matte finish which increases the tensile strength and relieves stress concentrations through impact.

This finish is necessary on gears to release grab from metals and to reduce the noise in gear trains by giving a non-directional finish to retain and evenly distribute the lubricant.

In its essence vapor blasting is the application of a mixture of abrasive, water and rust inhibitor from a special gun at high velocity. The high pressure stream is directed against the surface being treated, throwing 65 cubic feet of air per minute at 90 pounds pressure.

The roto finish process is a modern tumbling method which was developed during the war.

. . . *Continued on page 110*

5401

do you WASTE MONEY RISK ACCIDENT doing things the HARD WAY?

Take a trip through your plant today and note how many assembly and maintenance operations are being done in awkward or tiresome positions.

Imagine THEM BEING DONE ON PORTELVATOR THE HANDY HAMILTON PORTABLE ELEVATING TABLE

With Portelvator hundreds of assembly and maintenance jobs are accomplished at the *right height* and in the *best light*. And that means money in the bank and workmen on the job; faster work and fewer accidents.

Portelvator prices start at $155.00—place a couple at your workmen's disposal and watch results.

Complete description in FREE Bulletin No. P-5403.

WRITE FOR IT!

Address The Hamilton Tool Company, 832 South Ninth Street, Hamilton, Ohio

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CIRCLE INFORM-A-GRAM KEY NO. 1071

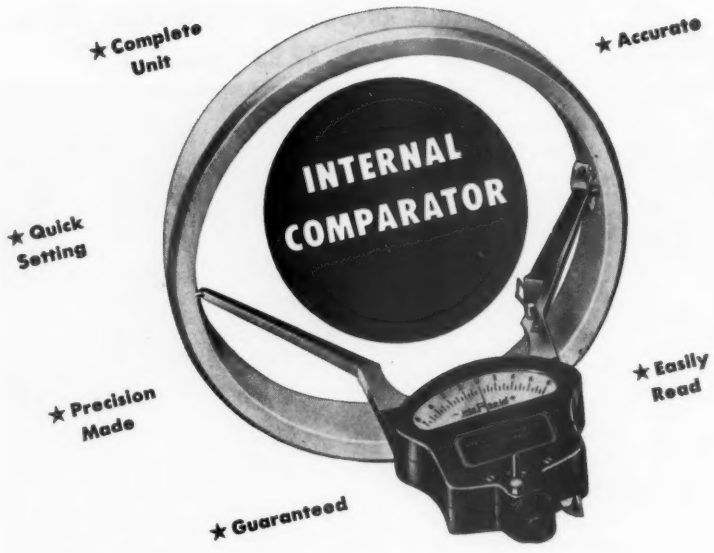
MEN YOU SHOULD KNOW

Edgar W. Engle, manager of product and process development engineering, Carboloy Department of General Electric Co., Detroit, has been named manager of cemented carbide products engineering. Mr. Engle has been active in manufacturing and developing cemented carbides since he came to Carboloy in June of 1941, as a foreman. He became metal department foreman in 1945; manager of process engineering in 1950, and manager of product and process development engineering in 1952.

◆

Appointment of **Marion V. Bailliere, Jr.,** as controller has been announced by the More Chain Co., subsidiary of the Borg-Warner Corp.

NEW "InteRapid"



New Internal Comparator Gage has gaging capacity from 3/8" diameter to 6" diameter. Meter-type scale, graduated in .0005", shows at a glance whether holes are oversize or undersize and by exactly how much.

Gage is designed for use on Jig Bores, Boring Machines, Internal Grinders, Lathes and for all Inspection Personnel.

For complete details . . . write for Comparator Specification sheet.

PDQ PORTAGE Double-Quick TOOL CO.
1046 Sweitzer Avenue • Akron 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1081

The Cleveland Metal Abrasive Co., recently announced that **O. S. Stewart,** formerly president of the company, has been elected chairman of the board. His son, **Ray J. Stewart,** formerly vice president, has been elected president of the 17-year old firm.

◆

B. O'Meara has been elected executive vice president of the Gairing Tool Co. Other appointments announced by the company: **William B. McClellan,** sales manager; **O. I. Boekle,** treasurer; **D. G. Hawksworth,** vice president; **Julius Pochelon,** secretary; and **Miss D. O'Neil,** assistant secretary.

◆

James Bere has been named assistant general manager at the Clearing Machine Corporation's Hamilton, Ohio plant. Mr. Bere has, until recently, managed the southern Ohio sales territory for Clearing and prior to that had worked in the firm's Chicago sales office.

◆

The Micromatic Hone Corp., of Detroit, announces the appointment of **Vas Peickii** as factory manager of its Los Angeles plant. Mr. Peickii is a former partner of the M. E. Engineering Co. of Los Angeles whose equipment and goodwill was purchased by Micromatic. He and his staff worked out several patents in the flat Microhoning Process which are still pending. Most of these new principles will see application in the new department which Mr. Peickii will head.

◆

The announcement of two promotions has been made by Lincoln Park Industries, Inc., of Lincoln Park, Mich. **John (Jack) Delaney,** formerly development engineer has been made vice president and factory manager. **Robert G. Field,** formerly plant manager, becomes sales manager and administrative assistant. Mr. Delaney whose entire career has been devoted to engineering, development and sales in the gage industry, joined Lincoln Park in 1952. Mr. Field's association with the company dates back to 1942.

MEN YOU SHOULD KNOW

Harry D. Curtis has been appointed general manager of the Solar Steel Corporation of California's Rawlins Bros. Steel Division in Los Angeles. Previously he was Solar's general manager of bar and tube sales in Detroit.

◆

The appointment of **Robert A. Manes** as vice president of the Cleveland Instrument Co. has been reported. Mr. Manes will be in charge of the company's expanding sales activities on precision dimensional gaging equipment. He has wide experience in the distribution and sale of precision gaging products and was formerly associated with the Fonda Gage Co.

◆

Pratt & Whitney, Division Niles-Bement-Pond Co., has announced the appointment of **Stanley W. Lovejoy** as manager of cutting tool research. His duties will include basic research, development and testing of products manufactured in the company's Cutting Tool Division. Mr. Lovejoy was educated at Massachusetts Institute of Technology. He comes to Pratt & Whitney from General Electric's West Lynn Works where he was tool supervisor and a consultant on cutting tool design and application.

◆

Philip H. Emrich formerly head of the product service department, has been appointed manager of the Joplin, Mo., manufacturing plant of Vickers, Inc., of Detroit. Mr. Emrich will direct all activities of the Joplin plant, which has approximately 1,000 employees and manufactures oil hydraulic pumps and controls for the aircraft and mobile equipment industries. Succeeding Mr. Emrich as product service department head is **Gregory M. McKeown**, who will be in charge of replacement parts, publications, training, product improvement, field service and repair of all Vickers products. Vickers also announces that **Thomas B. Doe, Jr.**, has been appointed the company's master mechanic. In his new position, Mr. Doe will be responsible for process engineering, tooling and allied activities for all Vickers products produced in the company's Detroit, Omaha, Neb., and Joplin plants.

Emil Gairing, founder and former president of the Gairing Tool Co. of Detroit has joined the Waukesha Tool Co. of Wisconsin as executive vice president. In his new capacity, Mr. Gairing is responsible for sales, engineering and production. He and his staff are available to the metalworking industry on tooling problems. Mr. Gairing is past president and currently a director of the Cutting Tool Manufacturers Association.

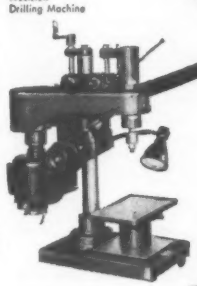
Frank A. Benoit, Jr., has been made foundry and pattern shop superintendent of the Brown & Sharpe Mfg. Co., of Providence, R. I. He succeeds **Leroy M. Sherwin** who has retired. After serving his apprenticeship with Brown & Sharpe as a wood pattern maker, Mr. Benoit progressed from assistant department foreman of the pattern job, to foreman, and then to assistant superintendent of the foundry.

5408

precision product?

EXACT HOLES ARE IMPERATIVE!

HAMILTON VARIMATIC®
Super Sensitive
Variable Speed
Small Hole
Precision
Drilling Machine



Are you fighting the never-ending battle of trying to produce exact holes on a drilling machine which, itself, is not built to precision tolerances? You are under no necessity to do so. For the difference in price between the cheapest bench type, small hole drilling machine and the Hamilton Varimatic is reckoned in pennies per day. And the Hamilton Varimatic (holes from .004" to 5/16" in all drillable materials) is *super sensitive*. Provides speeds, *infinitely variable*, between 840 R.P.M. and 9300 R.P.M. Is built to *precision tolerances*, and with the stamina to *retain* precision.

Get prices and specifications without obligation

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Address The Hamilton Tool Company
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IT'S A **Hamilton Tool**

USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 1091

. . . Vapor Blast, from page 107

Mr. Kopcinski says that a controlled action roto finish can remove heavy burrs or attain precisely uniform surfaces to exact tolerances easily, economically and in large quantities.

A similar, even more precisely controlled operation is afforded in an adaptation of the vapor blasting process where a tumbling barrel is introduced into the vapor blast cabinet and a fixed gun applies the abrasive solution.

International Harvester's East Moline Works has boosted forging die life by more than 25% and eliminated the final stages of polishing new and re-dressed dies with the vapor blast metal finishing process.

Following controlled tests which increased practical die life from 35,000 pieces between sinkings up to 90,000, East Moline Works adopted vapor blasting as a routine operation in finishing, repairing and redressing its dies.

Under the previous method, a Harvester spokesman said, East Moline prepared dies by hand sinking and scraping, obtaining 35,000 impressions between redresses. The first deviation from the old practice was the addition of chrome plating (without vapor blasting), boosting the life to 69,000 pieces.

When vapor blasting was added to this procedure the figure jumped to 120,000.

In the next test chrome plating was excluded, so that the operation included hand sinking and scraping, followed by vapor blast. This resulted in an average life of 90,000 pieces for each die and was adopted as standard procedure.

Chrome plating was left out of the standard procedure as impractical, Harvester said, since it was adaptable to only a limited number of special dies.

Improve Your Operating Efficiency, Quality and Profits with these LAST WORD Metal-Working Products!
Model A
Model B
Model C
LAST WORD WHEEL DRESSERS FOR RADIUS AND TANGENT ANGLE DRESSING — AVAILABLE IN 3 MODELS. MODEL A—For grinders using wheels up to 20" dia. MODEL B—For small model surface grinders with 7" max. wheel dia. MODEL C—Compound Dresser, will compensate for compound angles involved in grinding form tools.
SAMSON "Heavy-Duty" OFFSET BORING CHUCK—Has positive centering feature for drilling and milling operations. Complete accessories available.
GRAY-GRIMES FLOATING DRIVER—For reaming, tapping, valve seating and similar operations. Can be supplied with standard or special shanks and adaptors.
GRAY-GRIMES AUTOMATIC STEADY-REST FOR O. D. GRINDING—Permits grinding complete length of shaft maintaining constant pressure against work-piece as stock is removed.
Mfg'd by Gray-Grimes Tool Co.
Send for complete data
The Last Word
LAST WORD sales company
18500 MT. ELLIOTT (Dept. C) • DETROIT 34, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1101

Silicones Extend Liquid Spring Application

The development of special silicone liquids, having a high compressibility factor is expected to greatly increase the range of application for liquid springs. The results of extensive joint research and technical coordination between the Hydra Spring Division of Wales-Strippit Corporation and the Silicone Products Department of General Electric Company were announced at a recent G-E news conference.

The original Hydra Spring development was initiated by Wales-Strippit spring requirements in machine tool manufacture. Individual hole punching units had long been limited by the spring force available from standard coil springs. Units formerly capable of punching and stripping only ¼" thick material with coil springs are now able to punch and strip up to ¾" thick material by the use of more substantial forces from liquid springs. The Hydra Spring came into widespread use for hole punching and other die operations, and eventually modified versions were adopted in the design of numerous products requiring improvements over conventional spring systems.

In the search for improvements on the basic liquid spring development, attention was turned to the silicones. Through use of the new silicone liquids, compressibility of the basic spring units has been increased from the former 6.2% at 20,000 psi to as high as 12% at 20,000 psi. This provides approximately twice the force or stroke for the same size spring.

DIE MATERIALS FOR EXTRUDING ALUMINUM UNDER STUDY

Firth Sterling, Inc. of Pittsburgh was recent host to representatives of the aluminum industry at a forum on tool engineering problems relating to aluminum die extrusion. The objective of the conference was to determine condition of use and specifications of desirable die materials for aluminum extrusion prior to Firth Sterling's initiating a research program on the development of new alloys to meet aluminum extrusion requirements.

Companies represented included Loewy-Hydropress, Kaiser Aluminum & Chemical Sales, Inc., Bridgeport Brass Co., Midland Die & Engraving Co., Reynolds Metals Co., and Wyman-Gordon Co.

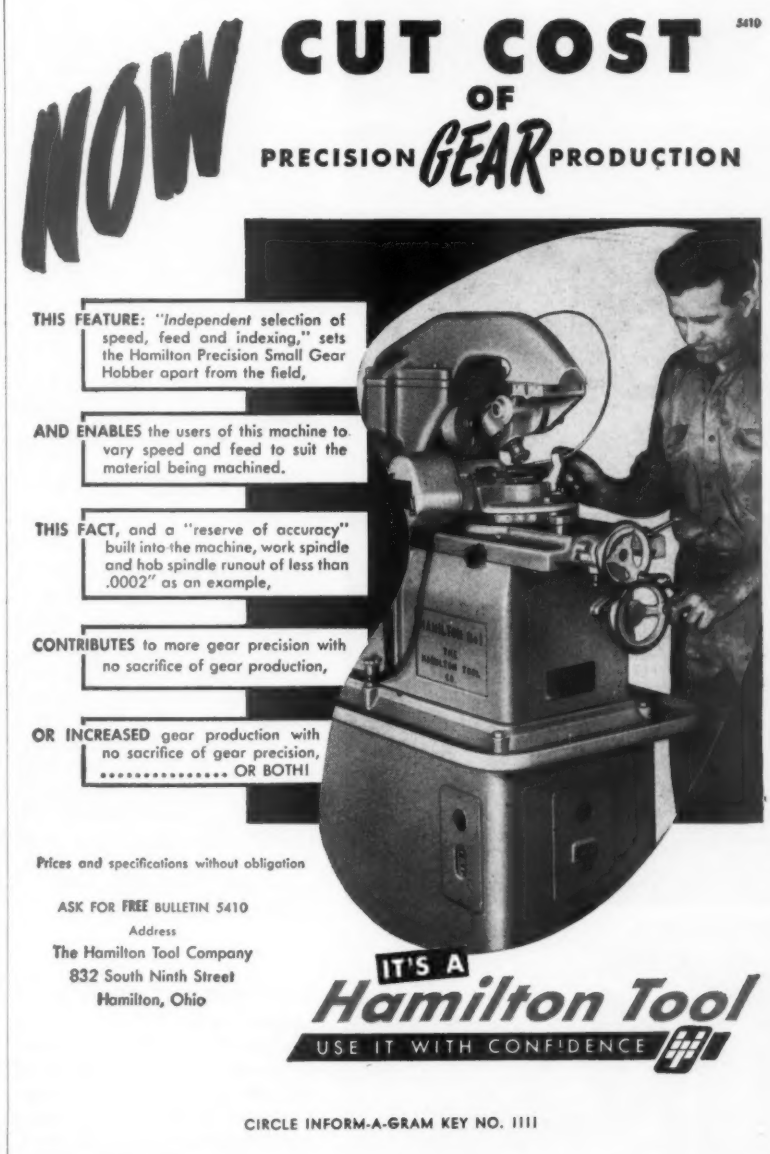
Resume of Discussions

It was agreed that estimated pressures at present run from 60,000 to 140,000 psi; however, due to friction in the material being extruded and between this material and the cylinder walls, the actual pressures encountered at the die face are from 40,000 to 75,000 psi. It is anticipated that these pressures will not rise above 80,000 psi in the near future. General practice appears to be to use a hot work die steel hardened to 46 to 52 Rockwell C, although one advised that high speed steel, with a hardness of approximately 35 Rockwell C, is being used in their plant for extrusion of tubing only.

There does not appear to be any single major factor contributing to the failure of dies. The failures appear to be about evenly distributed between breakage, wear and errosion, and it was felt that no attempts should be made to improve one of the characteristics at the expense of another. One of the predominating causes of short die life is the large amount of reworking of dies required because of differences in extruding characteristics between casts of material to be extruded. It was felt that increased hardness could hardly prevent scratching since the aluminum oxide which does the scratching is extremely hard. It was also mentioned that breakage often occurs because of inadequate support necessitated by the shapes being extruded and the insufficient hot yield strength of support materials.

The dies presently used are from 4" O.D. to 30" O.D., and from ¾" thick to 4" thick; each user having some difference in thickness for a given die in reference to other users. The ma-

. . . Continued on page 134


5410
NOW CUT COST
OF
PRECISION GEAR PRODUCTION
THIS FEATURE: "Independent selection of speed, feed and indexing," sets the Hamilton Precision Small Gear Hobber apart from the field,
AND ENABLES the users of this machine to vary speed and feed to suit the material being machined.
THIS FACT, and a "reserve of accuracy" built into the machine, work spindle and hob spindle runout of less than .0002" as an example,
CONTRIBUTES to more gear precision with no sacrifice of gear production,
OR INCREASED gear production with no sacrifice of gear precision, ... OR BOTH!
Prices and specifications without obligation
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Hamilton Tool
USE IT WITH CONFIDENCE
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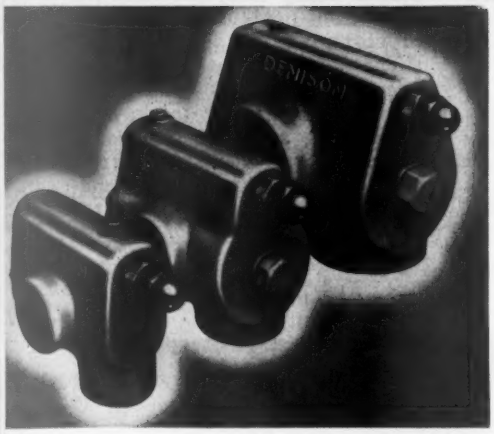
PROGRESS

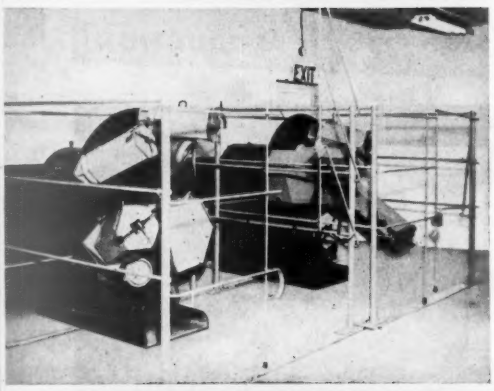
NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



RELIEF VALVES. . .

A new line of low priced relief valves designed for efficient pressure control in 2000 psi hydraulic circuits has been introduced by The Denison Engineering Co., 1140 Dublin Ave., Columbus, Ohio. The valves are available in pipe sizes of ½", ¾", 1¼", and 1½" and may be vented or operated by remote control. A technical bulletin is available. Write direct to the company, or—

Inform-A-Gram No. A1.



TUMBLE FINISHING. . .

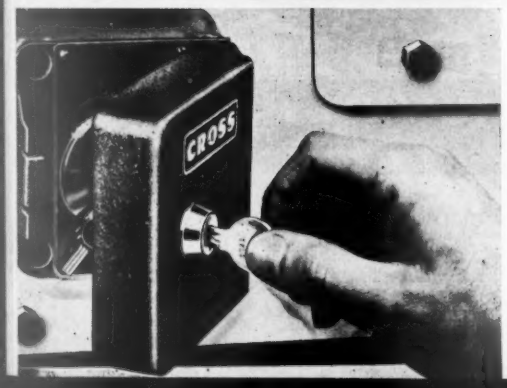
The BMT SlideHoning equipment is a multi-barrel unit with a 48" revolving disc on which can be mounted as many as 25 barrels with a variable rotating speed of 11 to 28 rpm and with different sizes and shapes of barrels plus a range of mountings. For complete details write BMT Mfg. Corp., Elmira Heights, N. Y., or—

Inform-A-Gram No. A2.

PRESSURE GAGE. . .

Hermetic sealing, corrosion resistance, and a choice of pressure ranges between 0 to 100 and 0 to 6000 graduation readings are some of the features of a newly designed pressure gage manufactured by Designers for Industry, 4746 W. Washington Blvd., Los Angeles 16, Calif. The gage also will withstand a 100% graduation range overload.

Inform-A-Gram No. A3.



PROTECTIVE DEVICE. . .

This Flow Control Lock is designed to prevent unauthorized personnel from tampering with the hydraulic feed setting on production machine tools. Literature is available from The Cross Co., Dept. 57P, Detroit 7, Mich.

Inform-A-Gram No. A4.

DIRECT LIFT VALVE. . .

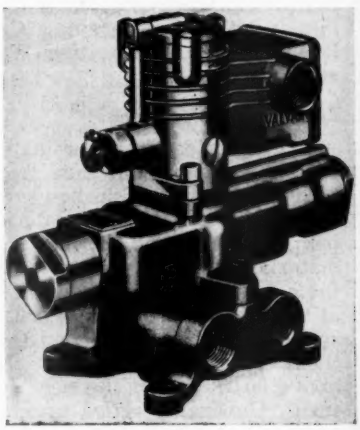
A new 5000 psi stainless steel solenoid direct lift valve in ⅛" and ¼" pipe sizes with high corrosive resistance has been an-

nounced by the Atkomatic Valve Co., Dept. B 299, 545 Abbot St., Indianapolis, Ind. Bulletin No. 100, which is available from the company, gives complete technical data.

Circle Inform-A-Gram No. A5.

AIR CONTROL VALVE. . .

A new Speed King solenoid pilot operated air control valve, designed to meet J.I.C. standards, has been added to the line of



control valves manufactured by the Valvair Corp., 952 Beardsley Ave., Akron 11, Ohio. All parts of product are totally enclosed. The pilot can be mounted in two directions over the base and is universal to all assemblies. Pressure range of this valve is from 35 to 200 psi for air and low pressure hydraulics. Literature is available.

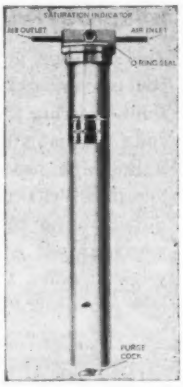
Circle Inform-A-Gram No. A6.

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

DEHYDRAFILTER. . .

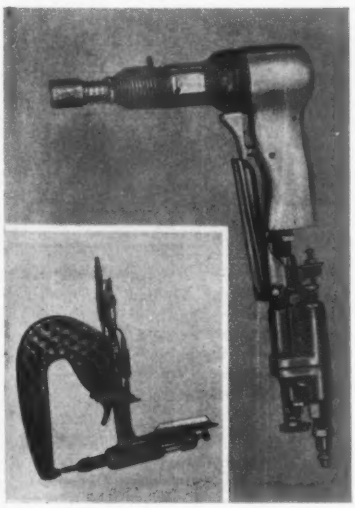
This is a small desiccant air and gas dehydrator designed especially for isolated pneumatic equipment. Rated at 1 scfm (saturated cubic feet per minute) at 100 psi gage and 70°F, the dehydrafilter features a disposable desiccant cartridge and "0" ring seal construction which eliminates the need of tools to change the cartridge. The unit will provide dew points as low as -67°F. For further information, write to Hankison Corp., 410 Biltmore Bldg., 951 Banksville Rd., Pittsburgh 16, Pa., or



Circle Inform-A-Gram No. A7.

"AIR/TIMER". . .

Extreme reduction in fabrication failure and non-productive man-hours is credited to a new "Air/Timer" introduced by the New Era Specialties Co., Benton Harbor, Mich. This rivet timer, which weighs only 8 ounces, enables the operator to predetermine the precise cycle of hammer blows his rivet gun will deliver.



Circle Inform-A-Gram No. A8.

AIR VISE . . .

This combination air vise is a heavy duty unit for conventional holding with 6" jaw faces, plus removable pipe jaws located in the lower portion of the jaws. The jaws open to 11" and will hold up to 6" diameter material. Details are given in a catalog offered by the Van Products Co., 3778 W. 12th St., Lakewood, Erie 2, Pa.

Inform-A-Gram No. A9.

DRILL BUSHING. . .

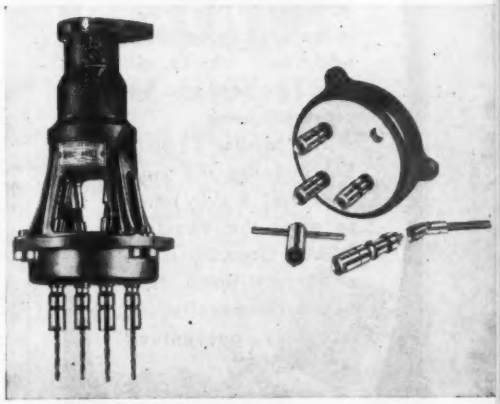
A new POP fit drill and pilot bushing that is easily installed and requires no press fit, has been developed by the Revere Fisher Engineering Co., North Branch, Mich. Inserts are replaced on the job with only a screw driver or Allen wrench and pliers. End plate interference quickly checked with plug gage. Literature available.

Inform-A-Gram No. A10.

FIXED POSITION PLATE.

An accessory which permits conversion of the Commander Multi-Drill to a fixed spindle multiple head without eliminating advantages of the fully adjustable Multi-Drill is announced by Commander Mfg. Co., 4225 W. Kinzie, Chicago 24, Ill. Unit provides for fast, accurate setup of intermittently run repetitive jobs. Further data is available.

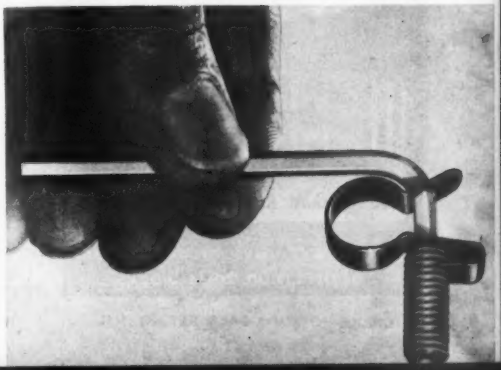
Inform-A-Gram No. A11.



TOOLING ACCESSORY. . .

This unique new tooling accessory solves the problem of keeping hex keys firmly attached to socket head set screws. Data available from Vlier Engineering, Inc., 4552 Beverly Blvd., Los Angeles 4, Calif. Write direct to the company, or

Inform-A-Gram No. A12.



Webber GAGE
43 BLOCK SET
$165
Accuracy ± .000008"

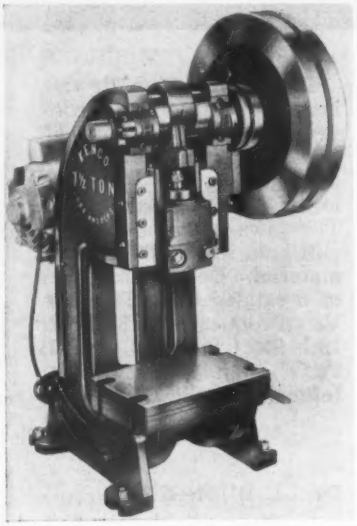
The ideal set of Gage Blocks for the small shop, or to use as an "extra" in the large shops where additional blocks will save time and also improve efficiency.

This popular 43 Block Set includes the most used sizes. Rigidly tested to meet the exacting Webber Gage Standards of surface finish, flatness and parallelism. Accuracy guaranteed ± .000008".

Webber GAGE CO.
12903 Triskett Rd., Cleveland 11, Ohio
Largest exclusive manufacturers of precision gage blocks

CIRCLE INFORM-A-GRAM KEY NO. 1141

Power Press. A 7½ ton power press of robust structure, rigid specifications and precision-built, is now being offered for sale by the Kenco



Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, Calif. This press is open-backed and inclinable. All parts are interchangeable and made extra-heavy for long life and trouble-free operation.
Circle Inform-A-Gram No. A13.

Abrasive Belt Sander. Announcement has been made of a new abrasive belt sander, called the Lange TV-106, for metal grinding, deburring and polishing operations. This machine can be equipped for either

dry or wet sanding and comes in various sizes, using either 106", 118" or 132" long belts. Metal working units can be furnished with any size motor desired. Full details may be had by writing Harry G. Lange Machine Works, Inc., 166 N. May St., Chicago 7, Ill., or—
Circle Inform-A-Gram No. A14.

SOUTH BEND
1000
TURRET LATHE

Cost Cutting Versatility

This precision turret lathe will cut your machining costs on small parts. Built-in accuracy, ease of operation and a wide range of speeds and feeds insure high production and close tolerances. Practical attachments simplify tooling the lathe for jobs which might otherwise require special fixtures. What's more, your least experienced operator will soon be a top producer on the 1000 Turret Lathe — it's that easy to run. Write for catalog . . . also information on 9" to 16-24" Lathes, 7" Bench Shapers and 14" Drill Presses.
Price as low as **$1574.00**

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941
WAGES UP 160%
MATERIALS UP 136%
PRICES UP 40%
Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

SPECIFICATIONS

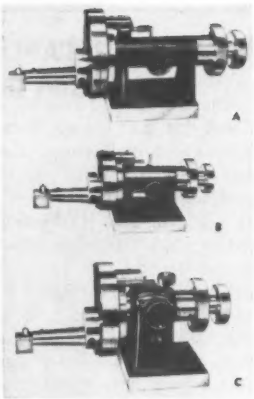
Swing — 10⅛"; Turret to Spindle — 19⅜"; Collet Capacity — 1"; Spindle Bore — 1⅜"; Spindle Speeds — 12, 50 to 1357 r.p.m.; Power Longitudinal Feeds — 70, .0007" to .0836"; Power Cross Feeds — 70, .0003" to .0303"; Thread Cutting Feeds — 70, 4 to 480 per inch.

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA
Building Better Tools Since 1906

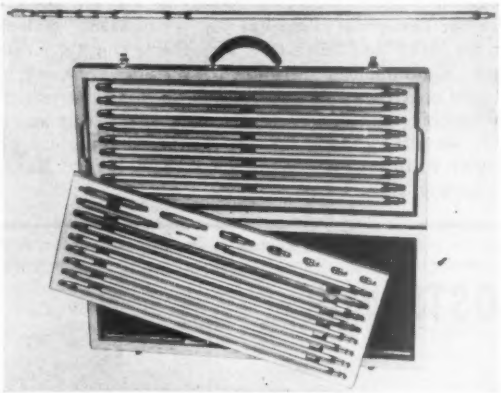
SOUTH BEND
LATHES

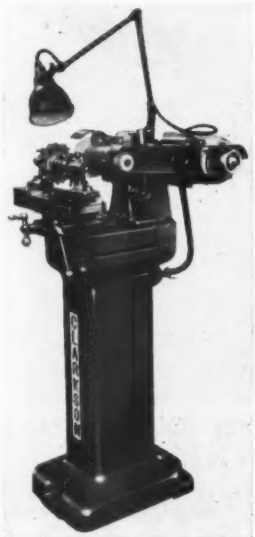
CIRCLE INFORM-A-GRAM KEY NO. 1142

Wheel Dressers. With a 3.400 center height, this wheel dresser can be used to dress any angle tangent to a radius, concave or convex, in any precision grinding wheel. Also, it permits dressing at the base of the wheel or point of contact. This feature allows the use of the wheel guard and dust collector during the dressing operation. Further details and literature can be obtained by writing to the Last Word Sales Co., 18500 Mt. Elliott, Detroit 34, Mich., or— **Inform-A-Gram No. 15.**



An Inside Micrometer capable of high accuracies up to 30′ is being offered on special order by the Brown & Sharpe Mfg. Co., Providence 1, R. I. The instrument has a minimum reading of 6′ and a maximum of 30′, and will measure any dimension in between. A special micrometer head and 25 extensions, used in combination, permit this broad coverage. In order to minimize inaccuracies in such long members, each extension is calibrated to the nearest 0.0001", permitting overall accuracy which is usually far better than that required in such large dimensions. For portability, the entire set is packed in a convenient carrying case. **Circle No. A16.**





Cutter Grinder. A cutter grinder with all the advantages necessary to volume production of cutting tools has been developed by Clarkson, Inc., 320 Ontario St., Toledo, Ohio. With this machine, cutters can be set and completely sharpened in 15 to 25 minutes according to type. Powered by a ½ hp motor, the Clarkson cutter grinder is always operated from the front, placing the work in easy view of the operator. The machine is ideal for sharpening end mills, slot drills, reamers, woodruff cutters, tee slot cutters, side and face cutters, cylindrical cutters, face mills, angle cutters and hollow mills. Further information available.
Inform-A-Gram No. A17.

Commander
TAPPER
★ Wider Range...1 Tapper Handles #0 to ¾" Taps
★ Automatic Tap Protection
★ Furnished to fit any Drill Press

Commander—"The Tapper That Thinks For Its Operator," has the adjustable full range torque control that instantly stops any tap when it becomes dull, loaded, strikes a hard spot or bottoms in blind hole tapping. Assures maximum tap protection, higher production, even with inexperienced operators.

Your nearby Commander Distributor can give you a demonstration in your own plant. Write for his name and a copy of the NEW Commander Full Line Catalog 851

COMMANDER MFG. CO.
4228 W. Kinzie St. Chicago 24, Ill.

Product of Commander... Builder of Production Tools

CIRCLE INFORM-A-GRAM KEY NO. 1151

OCTAGONS BILLETS AND FORGINGS FOR PRODUCTION.
100 YEARS OF SERVICE ROUNDS, SQUARES, FLATS, HEXAGONS.
TOOL ROOM AND MAINTENANCE REQUIREMENTS
TOOL & DIE MEN SPECIFY
HY-TEN
"M" TEMPER ALLOY STEEL
for maximum machinability and minimum heat-treat distortion. It has great toughness at high degrees of hardness and long-wearing properties for lowest unit cost. For complete information on HY-TEN alloy steels, write for FREE DATA BOOK.

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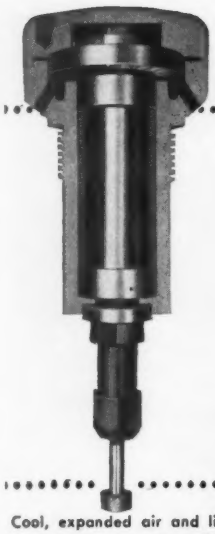
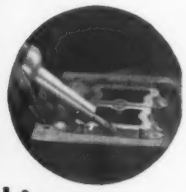
CIRCLE INFORM-A-GRAM KEY NO. 1152



air turbine speed for low cost grinding



Onsrud PORTABLE AIR TURBINE GRINDERS

Cool, expanded air and light weight provides easy handling. High rpm permits use of small diameter wheels—savings in wheel costs. Grease packed for life bearings—provide minimum of maintenance. For the toolroom, dieroom and assembly line.

ONSRUD MACHINE WORKS INC. 3941 Palmer Street Chicago 47, Illinois
write for Bulletin 1129

B-1B AIR TURBINE GRINDER 75,000 RPM

D-1A AIR TURBINE GRINDER 50,000 RPM

E-1A AIR TURBINE GRINDER 38,000 RPM

CIRCLE INFORM-A-GRAM KEY NO. 1161

NEW ADJUSTABLE DRILL JIG

eliminates layout; cuts drilling time

Used for drilling holes through round stock and hex stock from ¼" to 2" and cap screws from ¼" to 1¼", the new Mathewson Adjustable Drill Jig eliminates layout and can cut drilling time on small lots to a fraction. And it eliminates the costs of special jigs for larger quantities. Holes for cotter pins, set screws, drive pins for bayonet joints, oil holes in tubular sections, and wiring holes in cap screws, are all typical of the operation that can be done more economically with this jig. Hole diameters range from .052" to .531", using your A.S.A. standard slip bushings. The hardened V-block has two 60-degree V's for centering round or hexagonal stock, one for ¼" to 21/32" diameter, one for 21/32" to 2" diameter. Adjustable stop for locating work longitudinally for drilling any distance from end, may be used on either side. Adjustable bushing carriers hold slip bushings and clamp work securely. Jig highly successful in permitting use of inexperienced drill operators. For circular write to: **Mathewson Machine Works**, 38 Hancock St., Quincy, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1162

compare YOUR drill fixture COSTS with ANCHOR BUSHING templates

Anchor Bushing drill templates, using sheet metal or laminate plastic materials, are made flat or in compound curved forms at a fraction of cost and time required for similar conventional drill fixtures.

Your TOOLING COSTS are reduced in simplified design and fabricating methods. Your MATERIAL DOLLARS go further by using inexpensive hardened steel Anchor Bushings and sheet metal or plastic materials. Your PRODUCTION JOB TIME is conserved since lightweight Anchor Bushing templates reduce worker fatigue and storage problems.

Compare your drill tooling methods, as have leading aircraft tooling departments, with the Anchor Bushing Method.

Ask today for our Anchor Bushing Catalog – it describes methods, bushing styles, sizes and prices.

Solar Aircraft Company, San Diego, craftsmen use contoured Anchor Bushing drill template on nacelle of Lockheed P2V Neptune aircraft.

Standard Anchor Bushings for rivet or spot weld attachment to sheet metal or fiberglas.

Nutplate Anchor Bushings provide three coordinated screw and rivet attachment holes in one bushing.

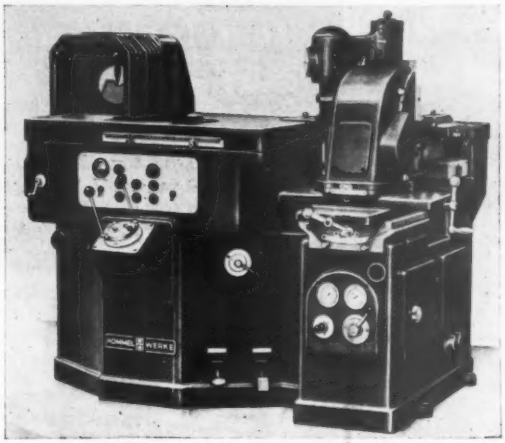
One piece Anchor Bushings for laminate plastic materials. Imbedded into plastic before heat hardening process.

THE *hi-shear* RIVET TOOL COMPANY

8924 BELLANCA AVENUE • LOS ANGELES 45, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1163

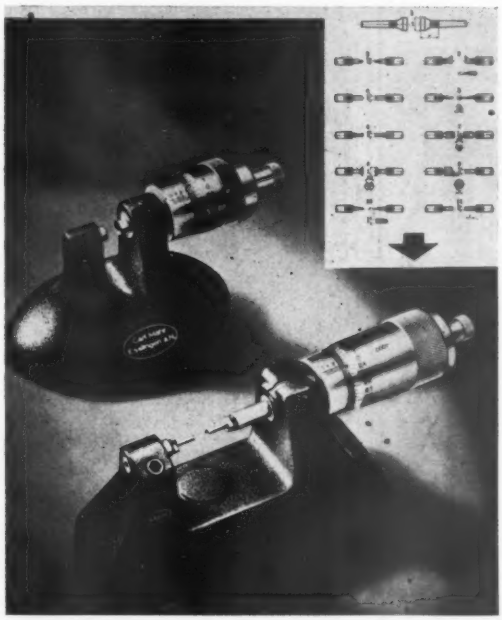
This Optical Profile Grinder, which is hydraulically controlled, greatly simplifies the manufacture of circular form tools, profile gages, forming rolls, templates, cams, punches, dies, etc. The desired profile is drawn with India ink on a transparent plastic sheet to any desired



enlarged scale between 10:1 and 50:1. The enlargement depends upon the accuracy required and the size of the workpiece. The drawing is placed on the projection table and the workpiece is ground to the layout. Technical details and other information are available from I.G.M.A., Inc., 347 Madison Ave., New York 17, N.Y.

Circle Inform-A-Gram No. A18.

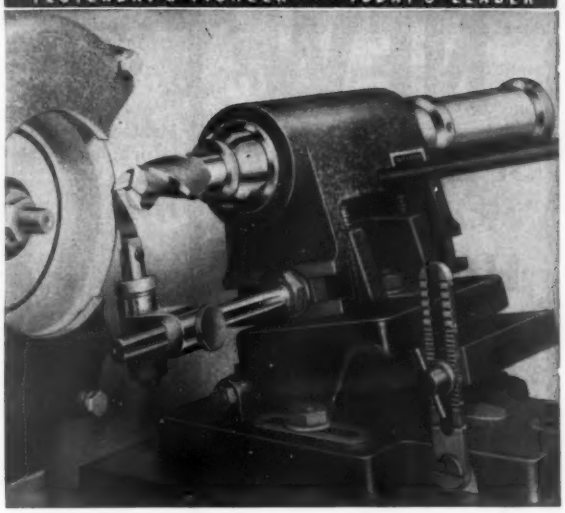
Bench Micrometers that read 0.0001" directly on the 1" diameter thimble, which is graduated into 250 divisions, have been announced by George Scherr Co., Inc., 200 Lafayette St., New York 12, N.Y. The micrometer heads are "Lustro-Chrome" dull finished for easy reading



and prevention of rust. The micrometer screw has hardened and ground thread. A circular illustrating the instruments is available. The lower model has a non-rotating plunger-type spindle for small, delicate work and takes 11 different shapes of contact faces.

Circle Inform-A-Gram No. A19.

YESTERDAY'S PIONEER · · · TODAY'S LEADER



WELDON
End Mill
Sharpening Fixture

• The Weldon Sharpening Fixture quickly resharpens end mills from 1/16" to 2" inclusive. Unnecessary to line up the fixture as it will always grind straight. Designed for any grinder with flat table. No table movement necessary.

Requires little skill to operate. Increases life of end mills and improves their performance.

Write for Circular FA2

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY
3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1171

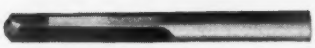
NEW
SPIRAL FLUTE
CARBIDE TIPPED
HARD STEEL
DRILL

SERIES 300

DIA.	DIA. OF BODY BACK OF CARBIDE	APPROX. LENGTH OF FLUTE	OVER ALL LENGTH	DIA. SHANK	APPROX R.P.M.	PRICE
1/16"	7/64"	1 1/16"	2 1/2"	1/8"	1000	$ 7.00
5/64"	11/64"	1 1/8"	3"	11/64"	800	8.50
3/32"	7/64"	2"	3 5/16"	7/64"	800	10.50
1/8"	11/64"	2 1/16"	3 1/2"	11/64"	700	13.50
5/32"	5/32"	2 1/16"	4"	5/32"	700	16.50
3/16"	3/16"	2 5/8"	4 1/2"	3/16"	600	19.50
7/32"	13/64"	2 7/8"	4 3/4"	13/64"	600	22.50
1/4"	17/64"	3 1/16"	5"	1/4"	500	25.50
9/32"	21/64"	3 1/2"	5 1/2"	9/32"	500	28.50
5/16"	21/64"	3 1/2"	5 1/2"	21/64"	400	31.50
11/32"	25/64"	3 3/4"	5 3/4"	25/64"	400	34.50
3/8"	21/32"	3 7/8"	5 7/8"	11/32"	450	37.50
13/32"	13/32"	4"	6 1/4"	1/2"	300	41.50
7/16"	13/32"	4 1/4"	6 1/2"	1/2"	200	45.50

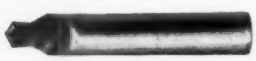
Advantages: 1. Spiral flutes — better chip disposal. 2. Better support for carbide tip. 3. Self-centering point — no weaving. 4. Hardened H.S.S. body. 5. Drills without annealing. 6. Low cost construction.

STILL AVAILABLE



SERIES 100

Hardened steel drill. Solid carbide cutting end. Will not anneal. Holds size perfectly. No coolant required on shallow holes. Available in 10 sizes: 1/8" to 5/8" dia.



SERIES 200

Drills center in hardened steel in one operation. Cuts clean centers without annealing and without use of coolant. Available in 4 sizes: 3/32" to 9/32" (drill dia.).

Write for data — Also our tool salvage catalog

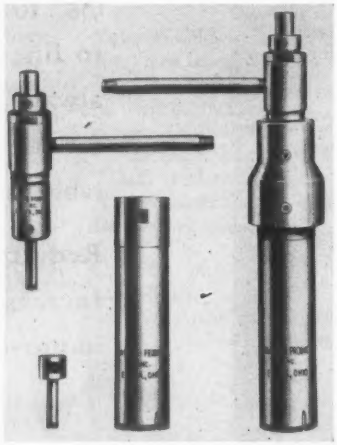
NATIONAL TOOL SALVAGE CO.
6511 EPWORTH BOULEVARD
DETROIT 10 MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1181

Indexing Table. This new indexing table is unique in that all working mechanism is outside the table itself. Adjustments can be made or working parts may be removed without disturbing the table or disassembling tooling. The table illustrated is 48" in diameter and 8½" thick, has six stations and is designed

for hydraulic operation. Models are available, however, in sizes from 20" to 40" in diameter and with six or more stations. All sizes may be equipped for either air or hydraulic use. When equipped for air, table operates on ordinary line pressures from 60 to 175 lbs. Complete information may be obtained by writing Air-Hydraulics, Inc., 264 Beldon Rd., Jackson, Mich., or—
Circle Inform-A-Gram No. A20.

Vinoy Diamond Impregnated Drills, in a new line for both laboratory use and production line techniques, are now being produced by Diamond Products, Inc., 326 Prospect Ave., Elyria, Ohio. These tools are used for drilling glass, quartz, glazed tile, china, marble, granite, cinder block and concrete. Many small diamonds are distributed throughout a



matrix of tungsten carbide or molybdenum. As the bit wears through use, new diamonds are constantly being exposed to provide long satisfactory service. The matrix is entirely used up in the drilling process and no resetting of the diamonds is necessary. This results in more economical operating cost. Specific material to be drilled determines the size and setting of the diamonds. For additional information, write direct to the company, or— **Circle No. A21.**

OLIVER
DIE MAKING MACHINES
Are BEST for Your Toolroom

Because . . . **their efficiency, speed and accuracy in machine sawing, filing and lapping save time and cut costs up to 60%. Simple to operate, OLIVER DIE MAKERS further reduce costs because they do not require expensive, hard-to-get skilled labor.**

For nearly 40 years OLIVER DIE MAKING MACHINES have proved invaluable on such jobs as production Filing, Experimental Work, Metal Patterns, Cams, Gages, Templates, etc.

OLIVERS have proved their worth in over 10,000 installations throughout the world. Many of these superior, long-lasting Die Makers have been in continuous use for more than 25 years.

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

***Write Today For Complete Technical Data on* OLIVER DIE MAKERS**

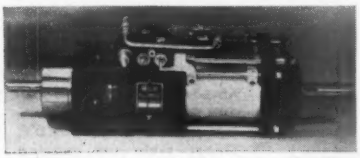
MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

See our catalog in Sweet's Directory

OLIVER INSTRUMENT CO.
1035 E. MAUMEE . ADRIAN MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1182

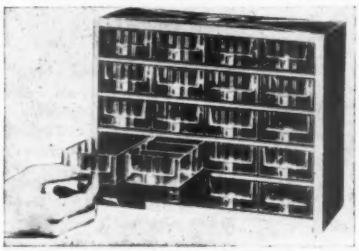
New Drill Unit. The Hause Model 04 air-hydraulic drill unit is a pulley drive spindle tool. It weighs only



44 lbs., yet is capable of production drilling operations up to ¾" in mild steel. For further data write to Hause Engineering, Montpelier, Ohio, or—

Circle Inform-A-Gram No. A22.

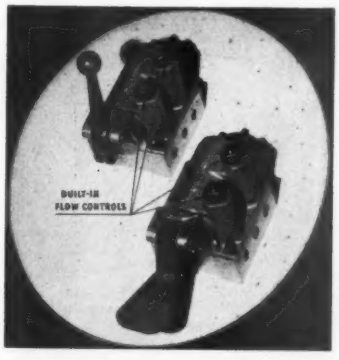
"See-Thru" Drawer Cabinets for small-parts filing and storage are now being produced by the General Industrial Co., 5738 N. Elston Ave., Chicago 30, Ill. The new model J-20 consists of 20 crystal-clear plastic



drawers, 5-7/8" long, 2-3/4" wide and 1-7/16" high, in a welded all-steel cabinet. Other models have capacities ranging from 8 to 128 drawers. Literature and additional information is available.

Circle Inform-A-Gram No. A23.

Four-Way Valve. A new hand-and-foot operated four-way valve with built-in, full capacity, Venturi type flow-control meters has been announced by Airmatic Valve, Inc., 7317 Associate Ave., Cleveland 9, Ohio. An air and low-pressure-hydraulic valve, it is specifically de-



signed for the control of double acting air or hydraulic cylinders. Noncorrosive throughout, this compact valve is available in four standard pipe sizes — ¼", ⅜", ½" and ¾" for air, oil or water, in pressure range 0-150 lbs. Further information can be had.

Circle Inform-A-Gram No. A24.

CONSULT P&S FOR THE BEST

Materials HANDLING EQUIPMENT
CUSTOM BUILT TO MEET YOUR NEEDS

Item S-426
$67.20

STOCK CHECKER'S TRUCK
Designed to handle a large variety of items or parts. Three steel shelves with 1" flanges all around. Floor clearance 9½". Overall height to top shelf 42½", top of table 50". 44" long, 20" wide. All steel welded construction. Semi-crated approx. 190 lbs.

UTILITIES RACK
on wheels
Item NS-415M $67.75 (Roller bearing, 6" x 2", all-metal wheels).
Item NS-415R $70.20 (Ball bearing, 8" x 1½", rubber-tired wheels).

MACHINE TENDER
on wheels
Item NS-428R $26.10 (rubber-tired wh'ls)
Item NS-428M $24.10 (all-metal wh'ls)
Built of sheet steel and angle iron-welded construction—tubular handle—approx. weight 65 lbs. 30" by 16" x 32" high. Top deck 2" deep, lower one 3" turned edges all around.

Item NS-298
$51.15

HAND DUMP TRUCK
Reinforced heavy sheet steel, ½ cubic yard, capacity—two 8" semi-steel wheels and two 4" metal swivel casters. Wt. 125 lbs.

Item S-987
$115.50

Heavy Duty
WAREHOUSE TRUCK
Use anywhere heavy loads are moved and rubber tired wheels are desired. 54" long, 28" wide, 42" high at handle. Top of platform 14" off floor. Welded construction. Heavy ⅜" plate. Two swivel wheels at handle end. Approx. wt. 300 lbs.

WHEN ORDERING always give "item" number. All PRICES are f.o.b. Detroit. Prices are subject to change without notice. Write for catalog.

DESIGNED AND MANUFACTURED BY
Palmer-Shile Co.
16039 Fullerton Ave. • Detroit 27, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1191

PRECISE
hole location,
easy contour
inspection with
new machine
tool microscope

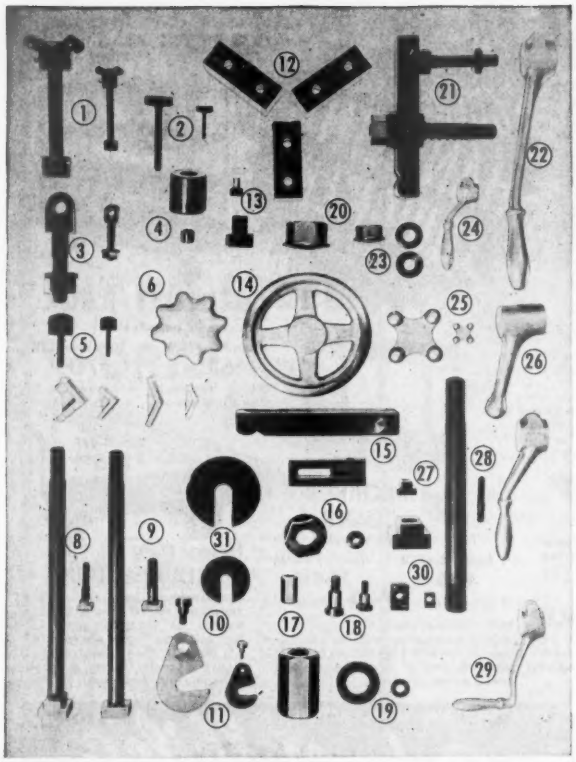
Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth—*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

Write today for complete details.

THE PERKIN-ELMER CORPORATION NORWALK, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 1192



OVER 500 JERGENS STANDARDS SAVE TIME--LABOR--⅔rds THE COST

Illustrated above are just a few of the more than 500 Jergens Standard Jig & Fixture Components. One of the most complete lines in production today, mass-produced Jergens Standards save you the skilled tool and die room help necessary for the custom making of component parts in your own shop. Keyed to the photograph and listed below is a brief description of a number of these items now immediately available from stock. Write for descriptive catalog and price list.

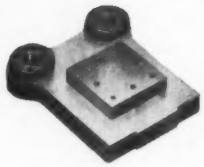
1. Clamp Shoe Assemblies—14 sizes—alloy steel screws—hardened steel shoes with snap ring lock.
2. Thumb Screws—4 sizes—3 lengths each size.
3. Latch Screws—4 sizes—hardened.
4. Jig Rest Buttons—4 sizes—hardened—ground.
5. Quarter Turn Screws—9 sizes—soft steel.
6. Palm Grip Hand Knobs—with reamed, tapped, or square hole.
8. Tee Slot Bolts—standard sizes ⅜" to 1"—various lengths.
9. Tee Bolts—standard sizes ½" to ¾"—various lengths.
10. Shoulder Screws—for use with swing "C" washer.
11. Swing "C" Washers—4 sizes—comes with shoulder screw.
12. Blank Soft Chuck Jaws—19 standard sizes—S.A.E. 1020 Steel—in stock to fit approximately 273 master chucks at a moment's notice—special blanks made on request.
13. Rest Buttons—4 sizes—hardened—ground.
14. Hand Wheels—4 sizes 6" to 12" in diameter—aluminum alloy.
15. Strap Clamps—hard and soft—plain or with radius.
16. Flange Nuts—9 sizes—hardened.
17. Extension Nut Couplers—8 sizes—alloy steel.
18. Shoulder Screws—24 sizes—Hex head socket—160,000 to 180,000 P.S.I.
19. Plain Flat Washers—8 sizes—hardened—ground.
20. Spherical Flange Nuts—9 sizes—hardened—ground.
21. Strap Clamp Assemblies—comes with spherical flanged nut assembly or hand knob for clamping the strap.
22. & 24. Offset Handles—aluminum alloy or malleable casting.
23. Spherical Washers—hardened—ground.
25. Hand Knobs—aluminum alloy casting.
26. Clamping Levers—aluminum alloy or malleable casting.
27. Tee Nuts—14 sizes—hardened.
28. Studs—stress-proof steel.
29. Crank Handles—aluminum alloy or malleable casting.
30. Fixture Keys—(hard or soft)—ground.
31. "C" Washers—22 sizes—4, 5, and 6 diameters each size—ground.

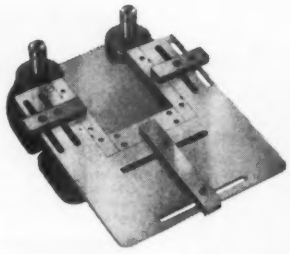
Jergens BETTER TOOLS AT LOWER COST **TOOL SPECIALTY CO.**
712 E. 163rd ST., CLEVELAND 10, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1201

Punches and Dies

Notching Die with Gauge Table





Standard stock sizes 4", 5" and 6". Lick those Notching Problems QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.

This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.

Immediate Delivery

What are your punch and die needs? Consult us about your problems. Prompt service on "Specials" made to your order.

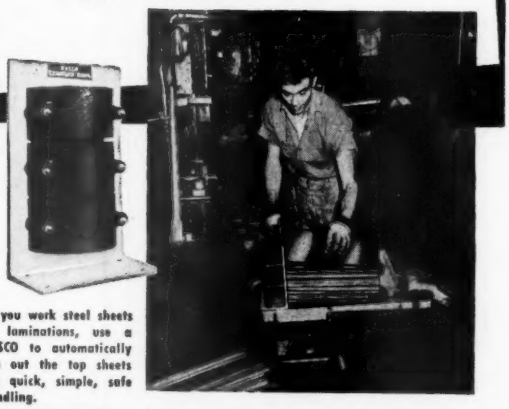
Send for free illustrated catalog No. 154 AB. Net prices shown.

WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1202

CUTLER HAMMER CO.

"Our BASCO Sheet Steel Separators have stepped-up production and cut-down injuries"



If you work steel sheets or laminations, use a BASCO to automatically fan out the top sheets for quick, simple, safe handling.

Five Standard Models to handle Round, Square, Nested or Odd Shape Sheets up to ⅛" plate, Stacks 48" wide and 10½" high.

SOLD ON APPROVAL — try a BASCO for 10 days. If not satisfied return to us.

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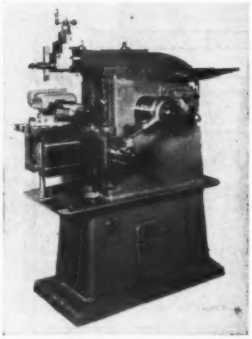
International Sales Agents
E. V. NIELSEN, INC.
128C BROAD STREET • STAMFORD, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1203

A New Contact Grinding & Polishing Machine is being made exclusively for the Curtis Machine Corp., Jamestown, N. Y., by an affilated company in Germany. Literature that contains complete details, specifications and illustrations is available. Write direct to the company or,— **No. A24.**



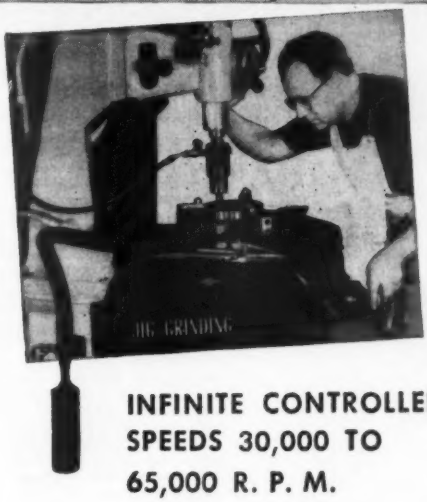
Prema Shapers. Illustrated in the Prema Model 02 13" shaper manufactured by A. B. Prema Maskiner, Varnamo, Sweden. This firm has appointed Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y., as its U. S. Distributor. The shapers are precise tool room machines and come in three sizes. Detailed literature is available upon request. **Inform-A-Gram No. A25.**

Granite Cube Parallels. Cube parallels in matched pairs made of black granite (diabase) are being produced by the Rahn Granite Surface Plate Co., 638 N. Western Ave., Dayton 7, Ohio. These cubes are precision finished on the top and bottom surfaces to a tolerance of 0.00005"

for flatness, parallelism, and the same height over the pair. Dimensions ore nominal within ± 1/32". Illustrated are a pair of 10" and a pair of 5" cubes being given the final inspection on a Rahn diabase surface plate. Further information is available.
Circle Inform-A-Gram No. A26.

This Air Operated Slide Feed features an open throat that will feed stock in any width as well as wire and tubing. The unit is self-contained, operating on standard shop air line pressures and brings automatic feeding to the hydraulic presses. For further data write to Cooper Weymouth, Inc., 277 Noble Ave., Bridgeport 8, Conn.
Circle Inform-A-Gram No. A27.

JIG GRINDING ACCURACY *guaranteed**



INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 6 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3⅛" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.

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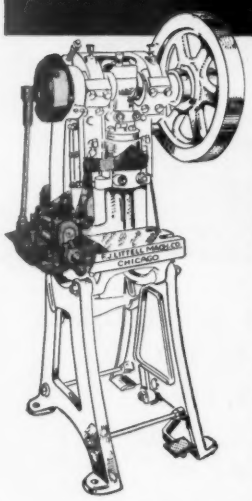
CIRCLE INFORM-A-GRAM KEY NO. 1211

Automation in Action . . .

LITTELL Style "M" ROLL FEED

Makes Any Punch Press Fully Automatic— and 3 Ways Better



- **FASTER** . . . 9,000 stampings an hour at 200 strokes per minute, or 4500 stampings an hour at 100 strokes per minute are easy production rates on any press with Style "M" Roll Feed.
- **SAFER** . . . Automatic feeding with Style "M" Roll Feed keeps hands and fingers safe from costly accidents.
- **LOWER IN COST** . . . Faster, automatic production from low cost coil stock cuts cost per stamping. Greater safety gives your presses the lowest insurance rate.

The Style "M" Roll Feed is quickly and easily installed on any standard punch press. Several models are available—the largest feeds coil stock up to 8" wide and .055" thick. All models feed left to right, right to left or front to back. Feed direction is reversed by reversing the clutch. On large models, feed length per stroke is from 0 to 4⅜" with standard gears, and from 0 to 8½" with compound gears. Feeding rolls are hardened and ground for long service life. Style "M" puts automation in your press room at lowest possible cost.

Write for the Littell Roll Feed Catalog

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REELS • AIR BLAST VALVES
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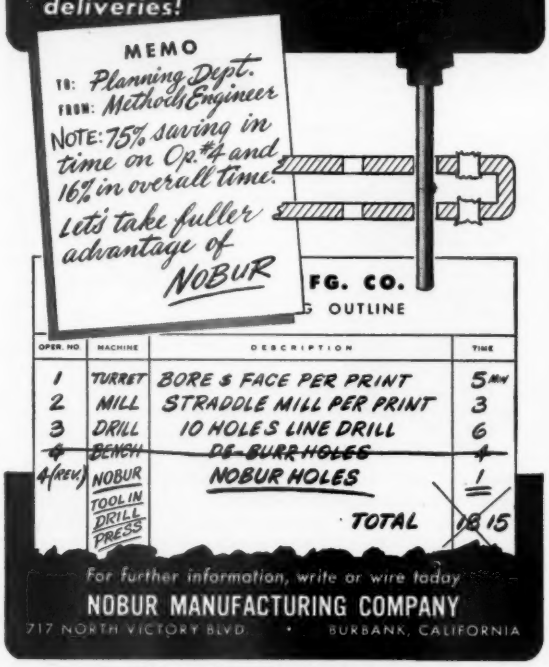
CIRCLE INFORM-A-GRAM KEY NO. 1221

Deburring with NOBUR *tool*

on drill press reduces production costs . . . speeds deliveries!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TO: Planning Dept.
FROM: Methods Engineer
NOTE: 75% saving in time on Op. #4 and 16% in overall time.
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OPER. NO. | MACHINE | DESCRIPTION | TIME
1 | TURRET | BORE & FACE PER PRINT | 5 MIN
2 | MILL | STRADDLE MILL PER PRINT | 3
3 | DRILL | 10 HOLES LINE DRILL | 6
4 | BENCH | DE-BURR HOLES | 4
4 (REV.) | NOBUR | NOBUR HOLES | 1
TOOL IN DRILL PRESS
TOTAL 15

For further information, write or wire today

NOBUR MANUFACTURING COMPANY

717 NORTH VICTORY BLVD. • BURBANK, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1222

FRICTION SAWING WITH *Tannewitz* HIGH SPEED BAND SAWS

GREATEST COST SAVER IN METAL CUTTING

Tremendous savings of time and money are effected in trimming formed parts with Tannewitz High Speed Band Saws, for not only are the cuts made exceedingly fast, and smoothly, but in most cases no jigs or rests of any kind are required. Sheets of both hard and soft steel, and even such metals as 1" armorplate are handled with great advantage by this method, and it is ideal for trimming malleable and steel castings. By all means get the complete facts and learn of the many opportunities for boosting production and lowering costs that Friction Sawing with Tannewitz High Speed Band Saws offers. Write for circular.

for trimming castings of all metals write for bulletin on "Foundry Band Saws".

☎ GL-6-1729

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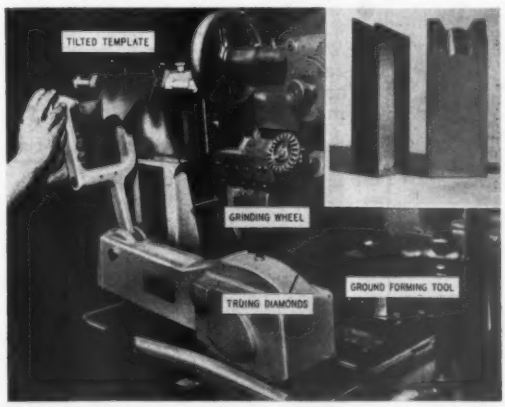
CIRCLE INFORM-A-GRAM KEY NO. 1223

This Electric Vibrating Pen, through its built-in electric magnetic vibrating system, will engrave any marking on all metals. Regular current reduced through a transformer to 2 to 7 volts makes the tool safe. Newage International, Inc., 235 E. 42nd St., New York, N. Y., has available data.
Inform-A-Gram No. A28.

A New Diaform Wheel Forming Attachment, designed to simplify the grinding of relief angles on forming tools, has been announced by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn. This new Diaform, available in three models, works on the well-

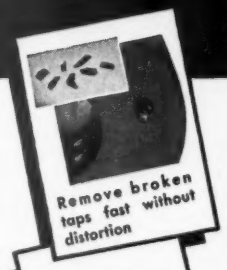


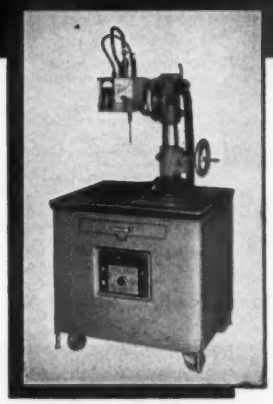
known pantograph principle. Called the Series "R" Diaform with Relief Angle Compensator, it successfully eliminates the need of distorted templates, projection drawings and lengthy calculations in order to retain the true form of the cutting edge on a forming tool when grinding the required relief.
Circle Inform-A-Gram No. A29.

Cutting & Grinding Wheel. For use with high speed portable air or electric grinders are these unique thermo-set plastic bond cutting and grinding wheels. Some of the advantages of the wheels are the speeds of 75,000 rpm or better that can be maintained and the ultimate

scratch-free finish on metals and materials. The wheels, called "Jabs" are used to polish tantalum and tungsten carbides, case hardened and nitrided steel, glass, crystals, ferrous and non-ferrous metals, gages, molds, dies, instrument parts, etc. For further information write to Abrasive Engineers, 245 Waukegan Ave., Highwood, Ill.
Circle Lnform-A-Gram No. A30.

METAL DISINTEGRATION
and what it can do for you





Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

There's a technical engineer in your area to give you an on-the-spot demonstration in your own plant at your convenience. (NOTE: It is not uncommon to pay for a Metalmaster with just one short demonstration through savings on workpieces.

There's a Metalmaster designed for your operation and priced to fit your needs. For information as to the many uses and benefits Metalmaster can offer you, write today on your company letterhead to:

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DIVISION OF CLINTON MACHINE COMPANY
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CIRCLE INFORM-A-GRAM KEY NO. 1231

SAVE COSTLY SET-UP TIME!
Instant Pin-Point Positioning
with these NEW MAGNETIC BASE
DIAL INDICATOR HOLDERS

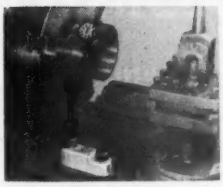
ENCO TINY-TITAN

"TINY-TITAN" No. 130

Magnetic Base Indicator Holder with Precision Adjustment

√ New, 3-Step Universal Rod in 7/32, 1/4 and 5/16" diameters, for all indicators.
√ Mounts to flat or down to 3/4" round surface, with 65 lb. pull.
√ Adaptor permits full 360° adjustment in all directions.
√ Many other new features.

PRICE: $9.50
Attractively Boxed.



Model 160 being used to indicate workpiece on Engine Lathe

A complete, new line of Precision Magnetic Base Holders and Lights that mount instantly to flat or down to 3/4" round surfaces with pull from 65 to 125 lbs.

"TINY-TITAN" No. 160

Heavy Duty, Duplex Magnetic Base Indicator Holder with Precision Adjustment

√ Magnetic pull, 125 lbs.
√ Fool proof adaptor.
√ Case non-breakable tenite; 1¼" x 4" x 1⅝" high.
√ Jack type magnet release.
√ 3-Step Universal Rod.

PRICE: $17.75
Attractively Boxed

Send for Bulletin No. 605, covering other Tiny-Titan tools.

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Sold all over the U.S. and Canada through Enco franchise dealers.

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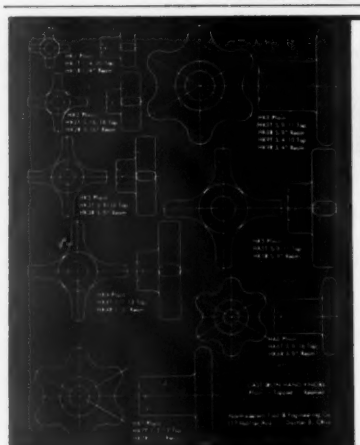

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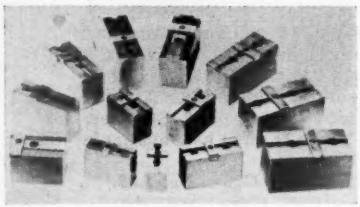
CIRCLE INFORM-A-GRAM KEY NO. 1243

Chuck Jaw Blanks. A new wide range of standard sizes of chuck jaw blanks to fit approximately 273 master chucks is announced by the



Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, Ohio. These blanks are made of S.A.E. 1010 steel accurately machined to American Standard Form.
Circle Inform-A-Gram No. A31.

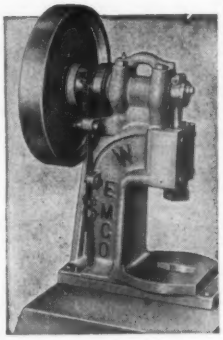
Tension Hydra Spring. This new Wales Tension Hydra Spring pulls rather than pushes to increase load and provides built-in snubbing action on return cycle. Capacity is to 7,000

lbs, and stroke up to 2⅞" maximum. For complete details, write to the Hydra Spring Division, Wales-Strippit Corp., 345 Payne Ave., N. Tonawanda, N.Y. for Bulletin "Hydra Spring", or—
Circle Inform-A-Gram No. A32.

New Boring Tool. Short neck boring tools, designed to facilitate the boring of short precision holes are now being produced by the Bokum Tool Co., 14775 Wildemere, Detroit 38, Mich. By virtue of the short neck of these 500 Series tools, an operator

achieves maximum rigidity with accompanying greater accuracy. There are 25 sizes in each of the Bokum styles—Style A for through boring, and Style B for bottoming—embracing necks of various lengths to meet a wide range of applications. The tools are available in both high speed steel and carbide tipped. For further data, write direct to the company, or—
Circle Inform-A-Gram No. A33.

EMCO "W", 5-ton bench type; also larger EMCO "X", 10-ton. Both sizes also stand-mounted. With or without motor drive.



EMCO

Power Punch Presses Are Speedy and Safe

Versatile EMCO presses excel for punching, forming, stenciling and riveting metal, leather, plastics and other non-metallic materials. Up to 300 operations per minute. "Big machine" speed, strength, rigidity, accuracy, endurance. Compact, foolproof; simple design—easy to operate. Thousands of EMCOS in money-making use testify to Klaas dependability since 1921. Two practical sizes.

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MICRO-HEIGHT GAUGE
BY FAIRFIELD GAUGE CO.

NO OTHER GAUGE COMPARES FOR FAST, ACCURATE LAYOUT AND MEASURING

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Capacities to 6" when used with this Fairfield Gauge 3" Riser

The Micro-Height Gauge is a precision instrument, finished in satin chrome, which reads like a micrometer and measures from zero at base to 3" in thousandths.

Use as a scriber for fast layout, or insert dial indicator for quick, accurate inspection.

Toolmakers, Layout men, and Inspectors do better work faster with Micro-Height Gauge.

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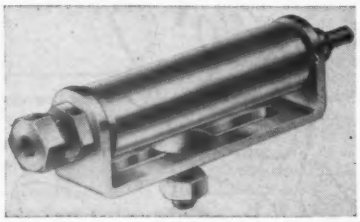
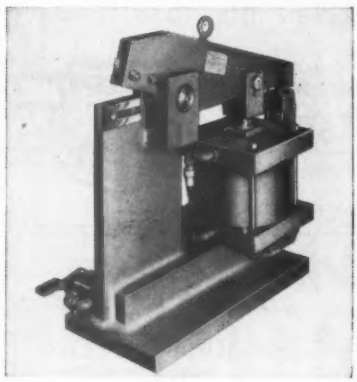
CIRCLE INFORM-A-GRAM KEY NO. 1252

Low Cost Air Cylinder. An air cylinder which features a new type of adjustable clamp is exceptionally well adapted where air operated



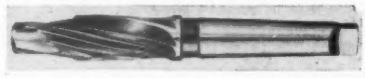
ejectors are required (i.e., in metal stamping, die casting and plastic molding). This unit is now being offered by The Summit Tool & Mfg. Co., 2907 Summit St., Toledo 11, Ohio. For full details, write direct to the company, or— **No. A34.**

A New Air-Operated Shear for cutting cold ferrous and non-ferrous bars up to 1¼" diameter has been developed by the Curry Air Shear Corp., 941 Oliver Bldg., Pittsburgh 22, Pa. This unit operates from any



standard shop air supply or compressor at pressures from 60 to 125 psi. It has no motors or gears to maintain, and, with practically no wearing parts, a minimum of maintenance is required. Copies of Bulletin 50-I-1, containing complete data, are available. **No. A35.**

Subland Taper Roughing Reamer. More than 70% of the torque encountered with the conventional type taper roughing reamer is said to be eliminated with a new Subland type roughing reamer. Elimination of the torque is a result of the right hand spiral action of the Subland, which is a freely end cutting tool. Flute



breakage and wedging also are reported to be eliminated, lengthening tool life by as much as 10 times. In the same time, the job can be done two to five times faster, leaving a cleaner hole for the finishing reamer. Properly applied, a Subland can accomplish two to 11 operations at one time. For further details write to Mohawk Tools, Inc., Montpelier, Ohio, or—

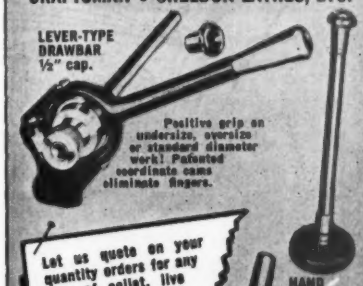
Circle Inform-A-Gram No. A36.

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

3AT, 3C
1A, 4C
5C
480
(AC-50)
All collets in hexagon, square and round.
KLUTCH-KOLLET
Step collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND CRAFTSMAN • SHELDON LATHES, ETC.


LEVER-TYPE DRAWBAR ½" cap.
Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.
HAND DRAWBAR ½" cap.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

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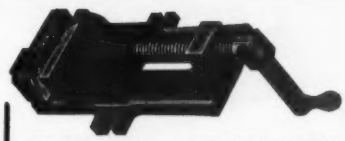
CIRCLE INFORM-A-GRAM KEY NO. 1253



YOST DRILL PRESS VISE

• This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	8½	25

Do you need a vise of ANY type?
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CIRCLE INFORM-A-GRAM KEY NO. 1254

Daddy, you keep calling Superman "Superdie". (SUPERDIE® is Daddy's favorite die steel).

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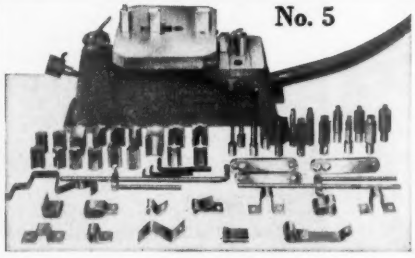
Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

CIRCLE INFORM-A-GRAM KEY NO. 1261



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CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x 4" air operated.

ALSO AIR OPERATED MODELS.

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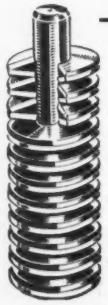
CIRCLE INFORM-A-GRAM KEY NO. 1262



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CIRCLE INFORM-A-GRAM KEY NO. 1263

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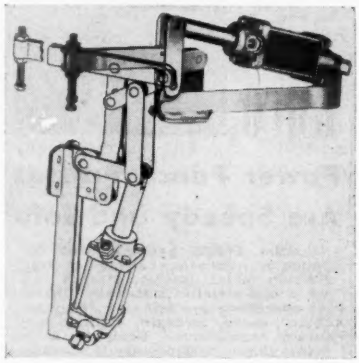
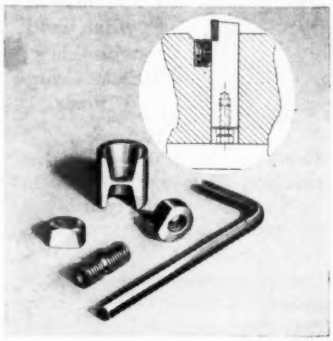


a conventional model air clamp, thus preventing the free operation of the air cylinder in the same plane. The clamp can be mounted in a vertical position, alongside the work but at a lower level, and allows the double-toggle action arm to swing in a 45° arc "around the corner" over the work to make spindle contact and perform an efficient clamping job. Further information is available. **Circle Inform-A-Gram No. A37.**

This Dual-Wedg Lock now makes possible an improved stagger tooth and half side milling cutter series for most general-purpose straddle, face, gang milling and slotting operations. The new Wesson cutter series, employing the Dual-Wedg



Lock, consists of a hardened steel body, broached blade slots and replaceable blades. Both the blades, tipped with Wessonmetal Carbides, and the cutter bodies are serrated for ease of adjustment. Additional information is available by writing to the Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich., or— **Circle Inform-A-Gram No. A38.**

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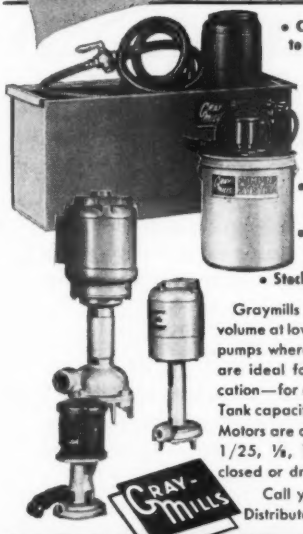

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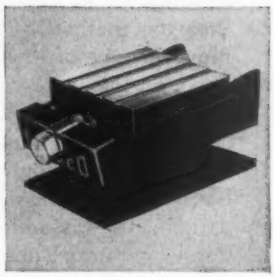

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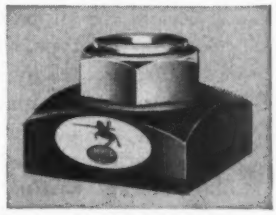

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CIRCLE INFORM-A-GRAM KEY NO. 1273

. . . Press Working Aluminum, from page 53

Lubricants

Although the most effective lubricant for press working operations such as deep drawing is a matter of controversy, it can be stated that the method of application, thickness of film and type of lubricant will have a definite effect on the end results. Among the types of lubricant that have been employed are mineral oil, lard oil, paraffin oil, tallow and water solubles. We have found that on many applications involving the use of a lubricant to which paraffin oil was added as a diluent, difficulty was encountered due to the extreme slippage experienced. In the drawing of the aluminum alloys, the use of the water soluble drawing compounds has given us good results without objectionable slippage. However, in a compound of this type, the use of a wetting agent is required which means that the handling and drawing of a wet blank is usually a necessity. Thus, on one occasion, difficulty in breakage was experienced when the diluted water soluble lubricant was permitted to dry.

The choice of lubricant for deep drawing will also hinge on both the gauge to be formed and the depth of draw; the deeper draws will usually require a lubricant with a high film strength. In regard to gauge, the thinner the gauge to be drawn, the thinner should be the consistency of the lubricant. In an operation such as spinning, the use of ordinary naptha laundry soap is usually preferred; however, mixtures of tallow, pump grease, beeswax, lard oil or white lead are also used. One difficulty that has been found with lubricants that are mixtures of these materials is that softening may occur during the warm summer months.

Conclusion

The forming of the aluminum alloys should provide very little difficulty; and the information given can serve as a guide to procedures. It is a recognized fact that procedures will vary with the individual plants and, in many cases, it is necessary to perform experimental runs to determine the variables which will influence forming. This experimentation is of particular importance where the deep drawing of irregular shapes is involved.

Successful forming of these alloys, especially where multiple operations are involved, requires a knowledge of correct annealing procedures. Information as to both annealing and press forming can be obtained from your material supplier.

Detailed operational procedures on such methods as brake forming, roll forming, stretch forming and the various other methods of forming have not been given. However, these methods are also used quite extensively; each method having a characteristic feature which permits its use on a competitive basis. Thus, roll forming is quite versatile in producing a variety of shapes where the production quantity is quite large. This procedure consists of feeding strip stock into a series of rolls that are arranged in tandem and which progressively form the section to its required form. Typical applications for roll formed sections, as produced by the continuous method, is trim, molding, butt tubing, seamed tubing, gutters, etc. Brake forming is known for its versatility in performing many types of operations which would include bending, curling, corrugating, seaming, punching, notching, trimming, embossing and many more. This method is usually identified with limited production runs; the tooling being relatively inexpensive as compared to identical operations being performed in press equipment.

Stretch forming is a specialty process developed and perfected during the last war. Although this process has been used quite extensively in the fabrication of "difficult to form" aircraft parts, it is now being used for the production of large parts within the automotive field. Roll benders are also used to a considerable extent, two of the more frequently used methods being the tangent bender and the three roll former.

Is your name on the back cover of this magazine?

If not, you may miss the rest of our **Air Power for Metalworking** series that started on Page 54. This series will continue through the next 5 issues and will cover the installations, maintenance and application of air systems. You won't want to miss a single one of these or many other "know-how" articles soon to be published.

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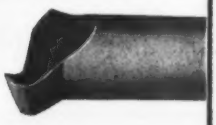

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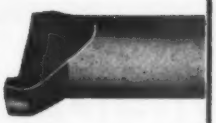

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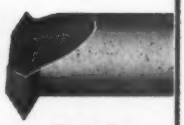

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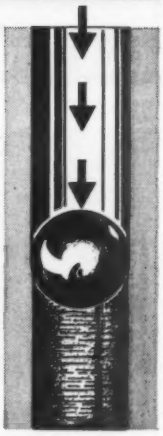

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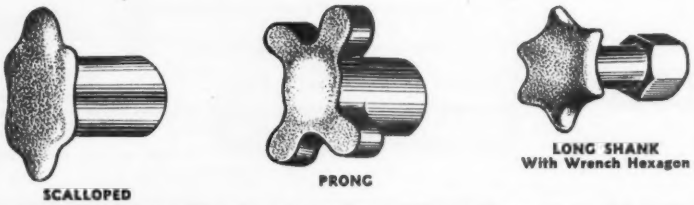

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CIRCLE INFORM-A-GRAM KEY NO. 1304

. . . Research, from page 32

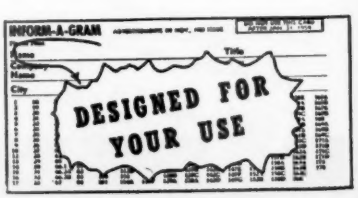
have dealt with the intergranular embrittlement of austenitic stainless steels and the solubility of carbon in these steels. The possibility of making a high-strength structural steel to meet Navy specifications is currently being studied.

Other Projects

Other phases of NBS work relating to aeronautics include computation of Loran navigation tables, development of methods for calibrating instruments used in aircraft manufacture and operation, and work on fire detection in aircraft engines and fuselages. A program of electronic miniaturization, sponsored by the Navy Bureau of Aeronautics, has done much to make airborne electronic equipment more compact, simpler and cheaper to produce and maintain, and more reliable.

Two automatic computers — the SEAC and the SWAC—were developed and constructed by NBS under the sponsorship of the Air Force. Both are large-scale superspeed electronic computers of the digital type. SWAC is being used to solve problems of the Office of Air Research and aircraft problems originating with contractors of the Air Force. SEAC is being used for a wide variety of scientific and engineering problems, many of them in the aeronautical field. A third computer, DYSEAC, now under construction for the Department of Defense, has interesting possibilities for use in the automatic control of air traffic at airport terminals.

Those examples of NBS contributions to the advancement of aeronautics that have been mentioned are only a few of the many that this agency has made and is making. Industry as a whole, and therefore the general public, has benefited to an immeasurable degree throughout the years by the Bureau's work.



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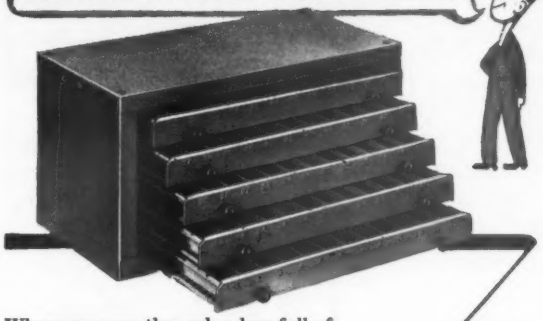

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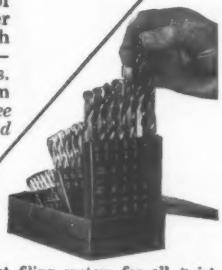

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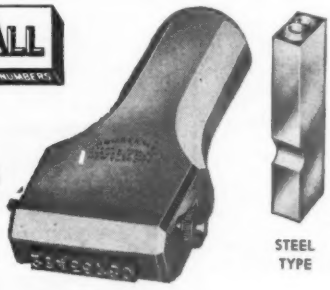

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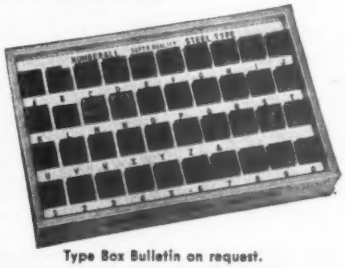

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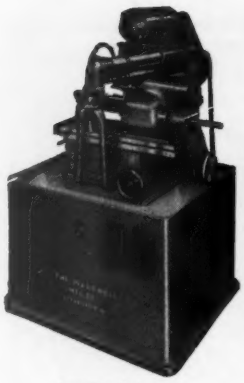

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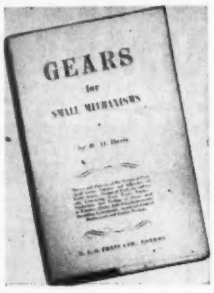

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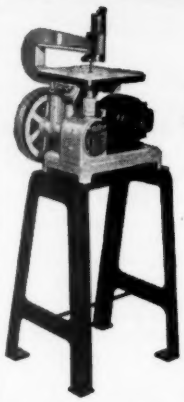

DIE FILERS

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This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

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. . . for high speed Precision Grinding of curved and Irregular Contours

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

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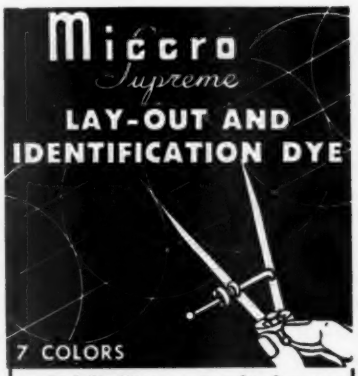

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For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheets, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

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CIRCLE INFORM-A-GRAM KEY NO. 1324

. . . Aluminum Plate, from page 70

Fig. 10. Aluminum jig clamps to wing so that workman can check throw of aileron at Douglas Aircraft Company, Inc.

Rubber Pad Process Form-blocks

A natural use for aluminum plate as a forming tool is found in form-blocks for rubber pad processes (see Fig. 12) such as the Wheelon, Guerin, Marform, and Hydroform processes. There are numerous low cost tooling materials available, but aluminum now appears to be one of the most generally suitable materials combining a number of optimum properties.

Plywood, pressed wood and Kirksite have been widely used for low cost form-blocks with rubber pad dies. Aluminum offers a number of superior properties, combining light weight and easy machinability with nonwarpage.

With the rubber pad processes, aluminum tooling has been used for making such aircraft parts as wing, empennage and control surface ribs. In addition, aluminum dies are used to form panels with stamped-in reinforcing ribs.

Fig. 11. Typical check fixture for casting straightness, fabricated from cast aluminum plate.

Fig. 12. Aluminum form-blocks being used to form parts by the Guerin process at Douglas Aircraft.

WALTON *SPECIALIZED* TOOLS
CUT COSTS IN METAL WORKING

Consider your costs of time, labor, and lost production due to difficult removal of broken taps, screws, studs, and pipes. On many jobs these costs are the difference between profit and loss. Walton Specialized Tools will help you recover some of these losses.
Likewise, tool changes can build up excessive costs. The Walton-American Tool Holder is a cost reducer. Its adjustable, swivel head may be set for straight, right offset, or left offset positions. Many holders in one immediately at hand at the machine. No lost motions.
Write for the Walton Tools Catalog #38. It will tell you how to reduce your costs. Liberal free trial offer on all tools. Sold by leading industrial supply dealers.

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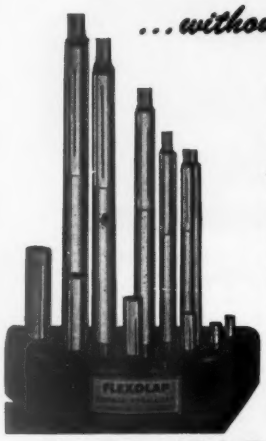
Flexolap... INSTANTLY AND ACCURATELY ADJUSTABLE FOR FAST CUTTING AND POLISHING

...without danger of galling or seizing!



The Flexolap barrel is made with a series of longitudinal slots milled "off-center" to permit sensitively flexible expansion up to 15%—or more—under pressure of the adjusting pin. This construction enables Flexolap to save valuable time and to lap rounder, straighter holes. For accurate precision take-up, as desired, to maintain size and compensate for wear on barrel . . . simply turn adjustment screw.

Illustrated at left is Flexolap Set No. 1. Includes 6 complete laps, one of each size (3/16", ¼", 5/16", ⅜", 7/16" and ½"), and one additional brass barrel of each size, all held on a sturdy, serviceable stand. Price complete $14.00

Also available in sizes 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16" and 3/4". For lapping holes smaller than 3/16", use the Midget Lap. Seventeen sizes: .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218, and .250. Trial assortment (17 laps) $2.10

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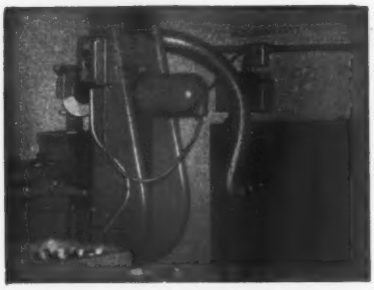
Ask for Catalog 605-2. Describe dust problem for recommendation by return mail—No Obligations.

AGET-DETROIT CO.

213 Main St., Ann Arbor, Michigan



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ALINA CORPORATION - *Ask your dealer, or write* **401 Broadway, New York 13, N. Y.**

CIRCLE INFORM-A-GRAM KEY NO. 1343

. . . Die Materials, from page 111

terial being extruded is generally heated to between 700°F and 950°F, with increase in temperature occurring during the extruding process. Some estimates of this higher temperature went as high as 1150°F.

One of the most difficult problems presently facing the industry is a suitable material for dies having tongues with large length-to-width ratios. These ratios at present are running around 4 to 1 maximums, but the industry is being asked to provide as high as 10 to 1 ratios. A suitable material for this application must have increased modulus of elasticity, resistance to shear, and resistance to torsional bending. A die steel capable of being finished to 8 micro-inch RMS surface finish would be adequate. Since it was felt that most of the die steels in use are annealed by the temperatures of extrusion, it was agreed that any steel retaining a hardness of Rockwell C 50, at 1000°F would be adequate for this characteristic. The steel should be able to withstand the corrosive action of hot aluminum and perhaps molten glass (used for lubrication). Thermal conductivity should be somewhat greater than presently used materials, but the increase should not be greater than 10 to 15%.

Thermal shock does not appear to be a problem, and cost is not in itself important, the only requirement being that the relative cost per pound of extruded products must be cheaper for a new steel than those currently used.

An additional problem brought out involved the necking of mandrels for producing internal openings in extruded products. It was considered likely that such necking occurs at the hottest point on the mandrel and is an elongation phenomena resulting from the stresses in tension created by the friction of the moving aluminum along the mandrel.

The people all expressed a desire for information regarding the hot yield strength of the die materials in the temperature range from 700°F temperature to 1,000°F. They also desired information with respect to the hot hardness of the materials of these ranges.

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1/5 the Time

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TYPEWRITER

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AGENTS
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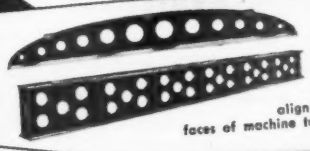
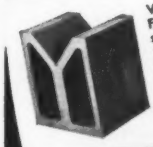


STRAIGHT EDGES—For scraping planer and lathe bed ways . . . parallel straight edges for inspection of alignment and bearing surfaces of machine tools.

UNIVERSAL BOX ANGLES Combines the clamping facilities of an angle iron, the stable accuracy of a box parallel with the perpendicular flat surface of an angle plate.

ANGLE PLATES—Made in 22 sizes from 2¾ x 4¾ x 4¾ up to 24 x 24 x 24 for clamping and holding work.

V-BLOCKS—Feature ribbed sides, light weight and a V accuracy of .0005 inch . . . for supporting shafts for drilling, checking, etc.



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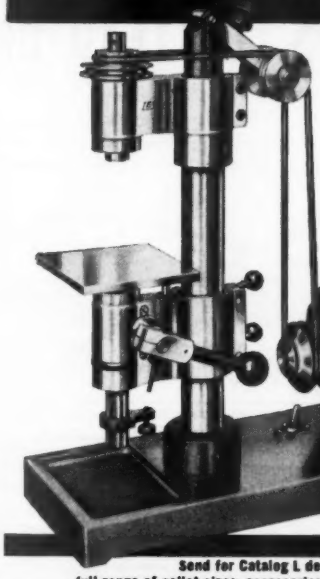
FOR VERY SMALL HOLES DOWN TO .002



Designed to hold small drills in precision collets, thus overcoming the difficulty of making a drill run true as when held in a conventional drill chuck. Absence of a sliding quill guarantees maximum sensitivity with fingertip control. A mounted ⅛" capacity chuck can also be used.

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- Jiffy Tires can be changed in 10 minutes without special tools.
- Provide 2 to 4 times more wear.
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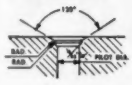
A MODERN TIRE FOR A MODERN SAW

NOW! PRODUCE A.N.D. 10050 PORT CONTOURS 3 TIMES FASTER!



The new Sonnet Port Contour Cutter completes all five operations in one pass!

Chamfering, counterboring, radiusing, countersinking, spot facing...all five are necessary to produce the A.N.D. 10050 port contour or connecting hole. Now, with Sonnet's new four-fluted, special-purpose contour cutter, all five operations can be completed with a single pass, *reducing job time as much as two-thirds!*

The new cutter is made from alloy steel and hardened for toughness. Carbide tips on all four flutes assure longer cutting life and smoother finish. Available in all sizes with integral or replaceable pilots.

Write for descriptive literature and prices today

Sonnet TOOL AND MFG. CO.
576 No. Prairie Avenue, Hawthorne, California
Specialists in carbide and high speed steel cutting tools

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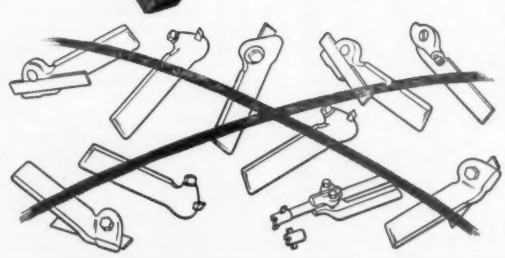
ONE TOOL HOLDER INSTEAD OF TEN



ONE tool holder for all positions . . . No tool chatter . . . can do internal boring or internal threading . . . Ideal for carbide tools . . . Bit sizes: ⅛", 5/16", ⅜", 7/16", ½", ⅝".

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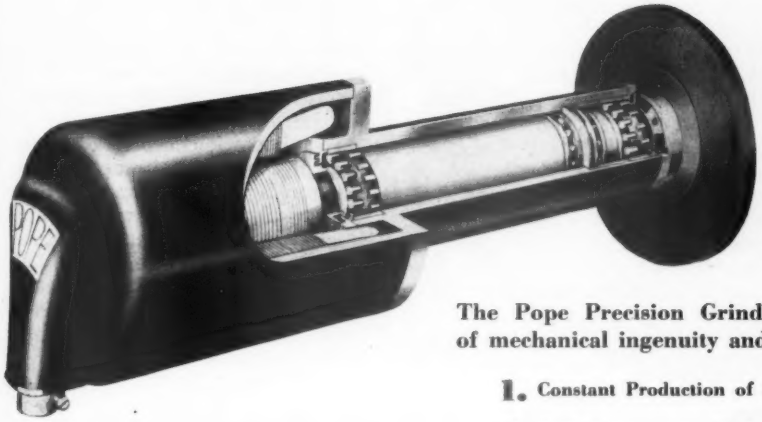
Bearings, Inc. is an authorized distributor of finest spindles for every purpose



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1. Constant Production of Finely and Uniformly Finished Surfaces.
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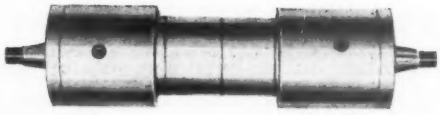

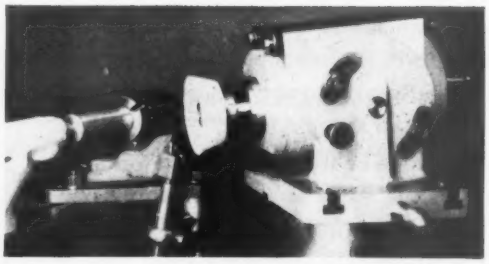

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CIRCLE INFORM-A-GRAM KEY NO. 1366

Apprentice Training is Given Special Attention by Small Stamping Plant

John Volkert Metal Stampings, Inc. has allotted one section of its newly-constructed plant building in Queens Village, N. Y., to the exclusive use of tool-and-die-maker apprentices. The apprentices have their own benches, tools and all the basic toolroom machines.

The Volkert apprenticeship program is revolutionary and unique for small industrial enterprises. Working under a veteran tool and die maker employed as a full-time instructor, the apprentices get constant instruction from him and, in addition, specialized instruction from other Volkert craftsmen. Under most small-plant apprenticeship programs, apprentices usually get supervisory instruction only when a slack of work permits.

"We recognize that high-precision tooling skills are in great demand in our mass-production economy," Jack Kleinoder, general manager, said, "and we've stepped up our apprenticeship program. We have been training apprentices on a small scale since our company was founded in 1934, but we now hope to have about a dozen or more at all times. Six are already taking the course."

This is thought to be one of the most ambitious apprenticeship programs ever launched by a company of the size of Volkert (140 employees), which is a leading supplier of precision metal stampings for the electronics industry. The program, covering four years for each apprentice, has the approval of both the New York State Apprenticeship Council and of the National Tool & Die Manufacturers Association.

Kleinoder is chairman of the Apprenticeship Committee of the NTDMA and is recognized as an authority in apprentice training.

Francis Beck, a veteran of almost 50 years as a tool and die maker, has been appointed Volkert's supervisor of apprentice training. Working under Beck, apprentices will get intensive training in their own shop for three years. In the fourth year, they will spend most of their time in the Volkert toolroom under actual working conditions.

Related classroom instruction, approved by the Board of Education of the City of New York, is being given to the apprentices in the Volkert plant two evenings a week. This instruction exceeds the minimum requirement of 144 hours per year.

All applicants, who must be at least high school or trade school graduates, must pass rigid aptitude, qualification and physical examinations. Apprentices sign an agreement under which they are hired for a 90-day probationary period.

Bench work comprises almost half of the 8000-hour apprentice training schedule. Among other things, they learn hand filing, micrometer reading, use of gages, layout work, assembling and finishing of dies, and die repair work. Volkert apprentices also must master the basic machines of the toolroom.

"Can't be Topped"

The Leitz Opti-Comparitol

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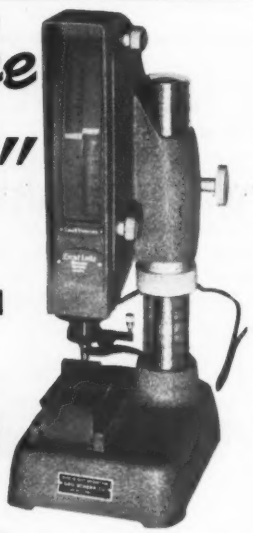

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CIRCLE INFORM-A-GRAM KEY NO. 1367

Atom Bomb Proof Vault is Planned at Timken Plant

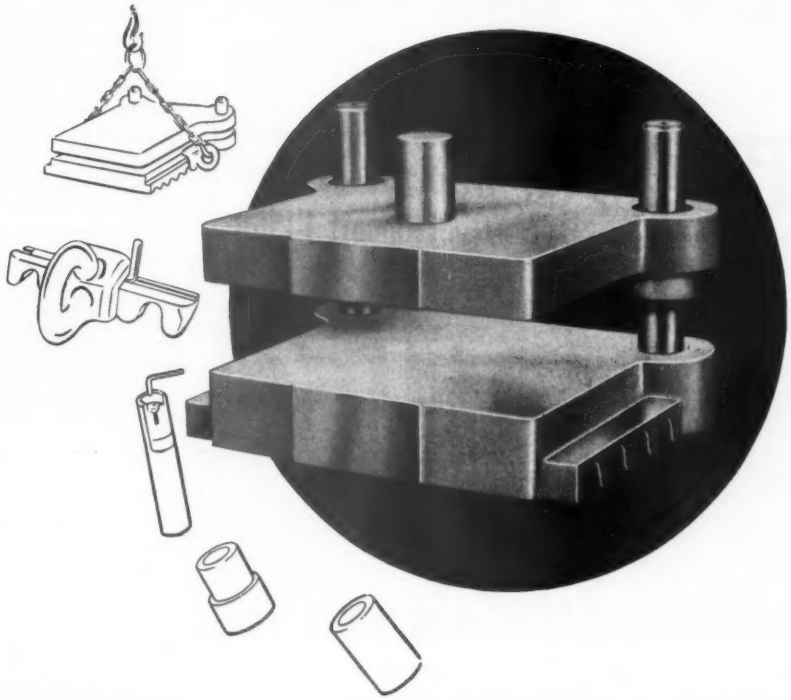
The Timken Roller Bearing Company has announced that it will build an atomic bomb proof vault at its New Philadelphia, Ohio plant. This vault will withstand pressures and heat from an atomic bomb hit outside of a half mile radius of its location. It is believed that such a vault is necessary to safeguard valuable microfilm records.

An example of the important records to be stored in the vault is the company's 375,000 engineering drawings, the number of which is growing at the rate of 19,000 a year.

The base of the vault will be eleven feet underground and it will be 27 sq. ft. and 16' high. Reinforced concrete will be used in the construction of the vault. The walls will be 15" thick and the ceiling, 18" thick.

A heat pump system will control temperature and humidity at all times. In the event of failure of the system, it is estimated that the microfilm will be protected for at least 30 days.

FAMOUS SUPERIOR DIE SETS NOW AVAILABLE FROM JERGENS



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Over 500 Standard parts including: Blank Jaws; Sine Fixture Keys; Clamp Shoe Assemblies; Thumb Screws; Jig Rest Buttons; Quarter Turn Screws; "C" Washers; Hand Wheels; Strap Clamps; Studs; Tee Set Kits, etc.

FEATURING REMOVABLE CAP GUIDE PINS

Enjoy the decided superiority of SUPERIOR DIE SETS and SUPPLIES including die springs, layout dies, lubricants, pins & bushings, bolster plates, etc., immediately available from Jergens. Superior Die Sets are available with easily removed cap guide pins that save time, effort, minimize danger of damage to costly dies.

Superior Die Sets and Accessories are distinguished for their long, accurate press runs—their precision manufacture of quality materials and for their exclusive safety features which safeguard against injury to handlers plus easier lifting and manipulating.

All these quality Superior features mean time, material and labor savings for you.

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Jergens BETTER TOOLS AT LOWER COST

TOOL SPECIALTY CO.

712 E. 163rd St. CLEVELAND 10, OHIO
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CIRCLE INFORM-A-GRAM KEY NO. 1368

NEW CLEVELAND COMPANY FORMED

Announcement has been made by A. G. Gullberg, formerly Cleveland District Manager for Danly Machine Specialties, Inc., of the formation of Diemakers Products, Incorporated. The new company, located at 2177 West 28th Street, Cleveland 13, Ohio, is specializing in die supplies, including particularly special die sets, die pins and bushings and the Hercules line of Toggle Clamps. Other diemaking supplies and production specialties are being added.

Hercules Toggle Clamps are adapted to work-holding fixtures for assembling, welding, or for any production clamping need. Engineered for rugged use, all holes are reamed to insure precision fit, and easy and efficient operation.

The company's newly assigned telephone number is MElrose 1-3434.

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for Tool and Plant Engineering needs call ENdicott 1-1560 for prompt service

TOOL DIVISION: Drills, Taps, Carbide Tools, Rotary Files, End Mills, Milling Cutters, Diamond Wheels, Air & Hydraulic Cylinders, Valves & Controls, Machinery & Equipment.

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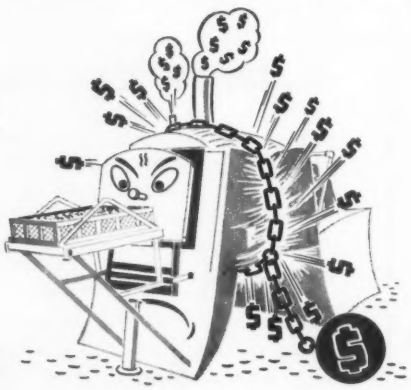
of Your Own Heat Treating Department



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CIRCLE INFORM-A-GRAM KEY NO. 1370

VAPOR BLASTING 100 TON DIES

The largest vapor blast liquid honing machine ever built was recently shipped to the Wyman-Gordon Co., Worcester, Mass.

The five-position machine was designed and developed by the Vapor Blast engineering staff after some 18 months of research and planning.

It will be used by Wyman-Gordon to clean and finish huge forging dies measuring up to 10 x 20 feet and weighing as much as 100 tons. The dies will be used on a new 50,000-ton press to make

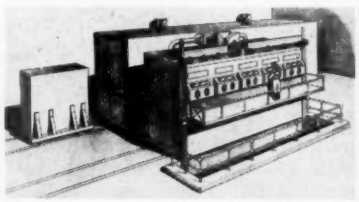

Photo courtesy Vapor Blast Mfg. Co.

larger than ever aircraft forgings under the Air Force Heavy Press program.

When installed at Wyman-Gordon's North Grafton Works the liquid honing equipment will occupy floor space of approximately 20 x 60 feet, by more than 14 feet high, plus a 10-foot deep base pit. About two-thirds of this area will contain a cleaning station where the dies will go through high pressure fluid baths before and after each vapor blasting.

Die finishers will work from a specially designed elevator platform which will move up and down along the face of the dies as they set vertically on a specially designed car. The car will move, in and out of the cleaning station and the vapor blasting station, on rails laid in the reinforced concrete floor.

Three special machinery hauling trucks were required to transport the dismantled machine from Milwaukee to North Grafton Works.

For Your Future

U. S. SAVINGS BONDS

. . . Metal Finishing, from page 87

used. Backchecks also are used for wiping metal strips such as brass and steel, and for cleaning metals prior to plating (as in the silver plating of cutlery) where it is imperative that defects and surface contamination be removed before plating.

The aviation industry uses thousands of rock-hard, durable felt bobs for finishing engine parts, including connecting rods, cams, oil holes and other parts having irregular contours which a plain grinding wheel could not handle evenly.

The aluminum industry uses a variety of mechanical finishes, either to alter the appearance or the properties of aluminum surfaces. Grinding calls for suitable abrasives such as aluminum oxide or emery. Wheel speed approximates 6000 sfpm. Higher speeds tend to overheat the work, while lower speeds may loosen the abrasive from the wheel.

Although polishing aluminum and alloys calls for the same procedure as the polishing of other metals, the actual operation is accomplished at lower wheel-to-metal pressures. Finer abrasives are employed for aluminum than for steel. Roughing, an aluminum polishing operation, uses wheels faced with abrasives of 50 to 100 grit. Greasing or oiling is a refined roughing procedure. A soft felt wheel faced with 100 to 220 grit aluminum oxide or emery, plus a lubricant (tallow or beeswax) to prevent overheating, is employed. Peripheral speeds of about 6000 fpm are used. This is an important and necessary operation in finishing castings and other fabricated work which has been marred by previous operations. Sand castings are invariably given this greasing treatment after being roughed, and die castings are given it as the first polishing operation. The felt wheel has the advantage of uniform density and contains no sewed or cemented seams.

The mirror-like finish of copper is obtained by buffing with a felt wheel, utilizing very fine and relatively soft abrasives, such as rouge (red ferric oxide), crocus (purple ferris oxide), tripoli, or lime. The buffing compound is prepared by mixing the abrasive with stearic acid and tallow and forming it into a bar or cake which is pressed against the revolving felt wheel.

Manufacture of Bobs and Wheels

All felt polishing wheels and bobs have one thing in common — nothing goes into them but wool and work. The manufacturing process involves hardening and extensive fulling, a mechanical process of kneading the wool fibers under controlled conditions of heat, pressure, moisture, and lubrication.

During hardening, batts of wool are agitated under pressure while in a warm, moist and slightly acid condition, to induce the individual fibers to become closely entangled forming a loosely integrated mat of uniform texture. This is followed by fulling which shrinks the hardened blank by persistent tumbling and pounding in a hammer mill. This increases the density to the point of solidification simply by impact, which drives the fibers still closer together.

Following fulling, the wheels are straightened, hot pressed to the required thickness and then seasoned in an oven to bone dry condition. Finally, they are bored and turned to diameter, trued and balanced.

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WITH GAUGE BLOCK ACCURACY
MAGNA-SINE

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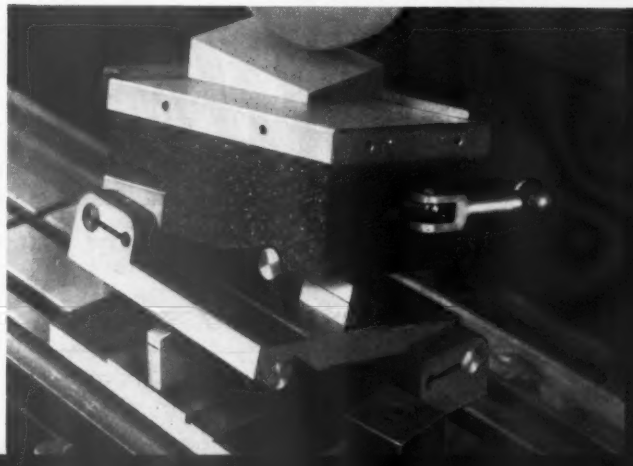

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RADIOACTIVE TRACERS REVEAL LONG-HIDDEN METALLURGICAL SECRETS

Radioactive tracers are being used by Aluminum Company of America as a powerful new tool in research studies, company spokesmen recently disclosed.

Radioactive tracers are usually tiny bits of material made radioactive by the Atomic Energy Commission at Oak Ridge. This material is then mixed, alloyed or combined with materials to be tested. The activated bits of material can be easily traced through complex chemical or metallurgical processes by means of sensitive instruments.

Alcoa researchers are using these tiny tracers in lubricant evaluation, corrosion resistance studies, analytical chemistry, alloy development, study of metal flow during the extrusion process, and many other projects.

The tracer program was initiated at Alcoa's Aluminum Research Laboratories by Dr. L. M. Foster, who had experience on the wartime Manhattan Project at the University of Chicago and Los Alamos, New Mexico.

In the field of lubricant research, the use of radioactive material has enabled Alcoa's researchers to measure the wear on bearings more accurately and to a much finer degree than was possible by other means.

These measurements are made possible by first making bearings radioactive, after which they are placed in a normal working situation. After a period of use, wear data is obtained by measuring the amount of radioactive material present in the oil bath covering the activated bearing. In tests completed at the laboratory, excellent wear data was obtained in the micro-inch range (1 micro-inch equals 1 millionth of an inch).

Through radioactive tracers, it is possible to learn more about the mechanism of corrosion of metals as it takes place—even before it becomes visible under a high power microscope.

A piece of metal is immersed in a corroding solution that contains a trace (as little as .05 of a part per million) of radioactive material. After a brief exposure, the metal is taken from the solution and a check made by Geiger counter. This procedure gives an accurate count of the corrosion material pick-up. Even a photograph of the corrosion areas can be made by placing the metal on a special film emulsion, which is sensitive to the rays of the radioactive material.

A promising metallurgical application of radioactive tracers is in the study of metal flow during the extrusion of aluminum alloys.

Extrusion is simply forcing the metal through a die of the appropriate shape and the metal thus takes the form of this shape. Extrusion is presently limited by slow speeds on hard alloys and the difficulty of obtaining smooth surface finish on the less hard alloys.

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To get increased speed and excellent finishing characteristics, engineers need to know what metallurgically happens in the ingot during the extrusion process. Flow patterns, temperature force distribution, and other similar basic information should be known.

In order to study the flow pattern, tiny pieces of aluminum alloy made radioactive in the pile at Oak Ridge are placed into holes drilled in the ingot. This ingot is homogenous since the radioactive alloy differs in no chemical or metallurgical respect from the remainder of the ingot.

After the ingot is extruded, the flow of metal from the regions "tagged" by the thread of radioactive material can be accurately established by measuring the activity of extruded sections with a Geiger counter. Exact location of the thread can be established by placing a cross-section of the extruded part on a special photographic film.

When a substance is placed in a neutron pile at Oak Ridge, it is bombarded by a tremendously large number of these subatomic particles called neutrons. More than three trillion of these neutrons pass through each square inch a second.

Occasionally, one makes a direct "hit" on the core or nucleus of the substance that is being bombarded. This nucleus then becomes radioactive, and the radioactivity becomes apparent when the substance "decays" and gives off its excess energy in the form of high-energy radiation. This material is thereby capable of being traced with special sensitive instruments even when mixed or alloyed with other materials.

These electronic instruments are so sensitive that even extremely small amounts of radioactivity can be measured. With suitable precautions, such as adequate shielding, there is no danger to the health of those involved in this program.

All the radioactive waste from each project is returned to Oak Ridge for disposal so that there is no danger of radioactive contamination of Alcoa's commercial products or industrial waste.

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Is your name on the back cover of this magazine?

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The Universal Compound Die is the answer to your Deep Draw, Shallow Draw, and Redraw problems. Irregular Shapes, Shaving, and Washers can also be easily produced with this remarkable die.

Its simplicity and low cost for change-over, in addition to its multiple use of parts makes the Universal Compound Die a must for your shop or plant.

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CIRCLE INFORM-A-GRAM KEY NO. 1391

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BLIND HOLE TAPPING LUBRICANT

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Formulated to facilitate fast, accurate tapping of threads in blind holes, Hypertap permits tapping within 1-½ threads of the bottom of hole. It allows the use of finishing taps for the first cut—eliminates back-outs!

Because it is a fine quality multi-lubricant, Hypertap prevents "weld" between taps and non-ferrous metals. It lubricates and cools the tap in thread-cutting. Being non-corrosive, Hypertap requires no degreasing after its use.

Hypertap sticks are packed in 3 lb. cartons. Standard lengths: 7½". Available in diameters from ⅛" and up. Easy, convenient to use.

With Hypertap in blind hole, finishing tap can be used to cut to within 1-½ threads of bottom—without backing out!

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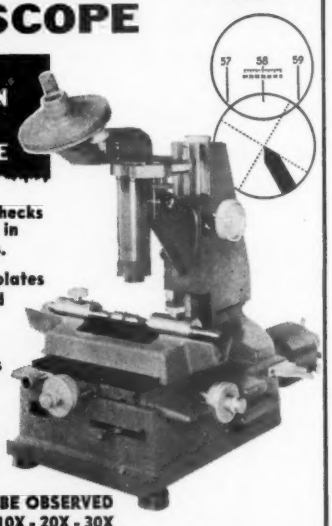

The NEW LEITZ DESIGN checks angular measurements in degrees and minutes.

Contains all Thread Templates for U. S. National thread profiles 6-80 pitch.

Contains Radii Templates from 21/64" to 13/16" by 1/64". Concentric circles from .010" to .280" by .010" and one blank compartment.

NOTE: TEMPLATES CAN BE OBSERVED IN 3 MAGNIFICATIONS: 10X - 20X - 30X

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CIRCLE INFORM-A-GRAM KEY NO. 1402

. . . Power Extruding, from page 84

tion is its uniform hardness from surface to center in large sections.

In the case of steels formerly applied, failure of the ring occurred when the strain exceeded the elastic limit of the steel. Even though the ring die is press fitted into a four-foot diameter hardened retainer ring (Rockwell C-34/36), the force exerted in the extruding operation stretches the die so that the inside diameter becomes too large for the close tolerance requirements of the cup. This must be held to .010" of specified wall thickness.

Here's an indication of the degree of cold work done in this operation. During the cold forming of the 14-lb. 6-oz. slug, the hardness of the SAE 1010 steel increases from about Rockwell B-60 to B-90. The resulting increase in mechanical properties in this and all subsequent operations meets specifications exactly and eliminates the need for final heat treatment of the finished nose.

Adjustable Drill

With two sets of blades this adjustable drill can cut from 1" to 1½" and from 1½" to 2" diameter holes. It will replace many dollars worth of solid high speed steel drills and reamers, and since carbide tipped blades are available it will materially reduce the inventory of tipped high speed steel drills.

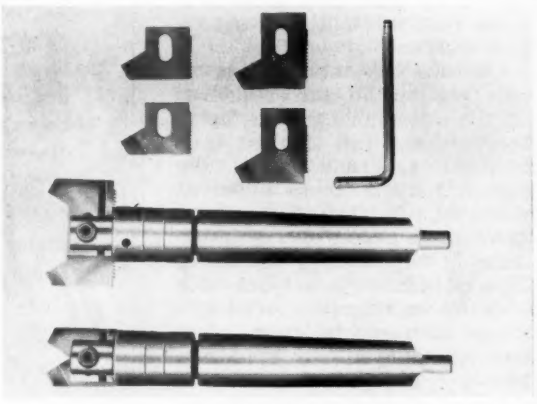

Photo courtesy Hayden Twist Drill Co.

The illustration shows the blades and wrench. A scroll ring engaging the bottom sides of the blades performs the double function of adjusting the blades and supporting them against the thrust of the cut.

The drill finds its greatest value when used on drill presses and radials, where its balanced cut works ideally with the normal spindle construction of such machines.

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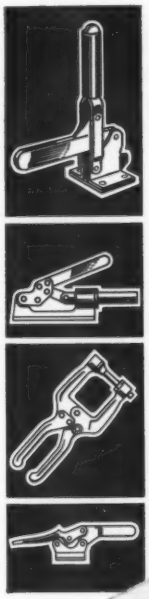

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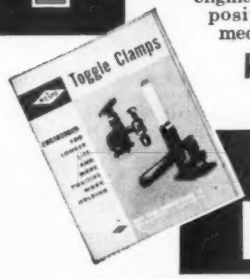

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CIRCLE INFORM-A-GRAM KEY NO. 1414

. . . Saw Bands, from page 85

overhead savings in this instance do sustain a previous claim of the high-speed steel blade's minimum productiveness. It should also be mentioned that the same feeding pressure was used to cut both dies.

It can readily be seen that although the high speed saw blade costs a great deal more than the carbon steel blade, it is negligible in considering the over-all lower unit cost that resulted in the production of the second die. It also freed the machine and die maker for the next job. Further economies not considered but to be noted in the following case histories is the longer life of the high-speed steel blades.

Test "B"

This customer made a comparison of a ¾" — 8 pitch high speed steel blade with a ¾" — 10 pitch carbon steel blade on Timken Alloy AMS 5727. The band machine used was a Contour-matic MP-20. Ultimate failure of the high-speed steel blade, which occurred after cutting through 98.8 square inches of the material in 1 hour and 45 minutes, was due to loss of set on one side of the saw teeth which caused lead-off (cutting on a radius instead of a straight line). Examination revealed that worn and bell-shaped guides were responsible for the set failure. It is significant that the blade was still sharp and able to cut at the time of retirement at a faster rate than a new, unused conventional type blade. In contrast, the carbon steel blade which wore out after cutting through 23.5 square inches of the alloy in 4 hours was ready to be scrapped because all the set was gone. The economics of this test as shown in the following chart prove that the initial high cost of the high-speed steel band is more than compensated for by the increased tool life, the faster cutting rate and the increased machine capacity.

	Carbon Steel Blade	High-Speed Steel Blade
Number of blades used	4.2 *	1.0
Cost per blade	$ 2.77	$19.73
Total blade cost	$ 11.73	$19.73
Total sawing time (setup time not included)	20.6 hrs.	1.8 hrs.
Tool room saw rate	$ 4.00/hr.	$ 4.00/hr.
Total saw time cost	$ 94.13	$ 7.20
Total cost for sawing 55½" (not including setup costs)	$105.86	$26.93

*The asterisk denotes the figures for the plain carbon steel blade which were obtained by extrapolation of the actual results of the first two cuts.

Test "C"

The following customer comparative test concerns the cutting of No. 93 Atlas shock-resisting tool steel, Rockwell Hardness, 87 "B".

	Carbon Steel Blade	High-Speed Steel Blade
Number of pieces cut	100	249
Total cutting time (hrs.)	9.2	13.5
Total hours to cut 249 pieces	22.9	13.5
Number of blades to cut 249 pieces	2.5	1

As shown above, in order to duplicate the 249 pieces cut by the Demon high-speed steel blade in 13 ½ hours it would require 2 ½ carbon steel blades 22.9 hours. Although blade cost for the Demon blade is more than double the total required carbon blades, the big difference in final cost is allocated to labor and overhead as noted in the following cost analysis.

	Carbon Steel Blade	High-Speed Steel Blade
Blade cost	$ 5.33	$12.83
Weld	1.25	1.00
Total blade cost	$ 6.58	$13.83
Labor cost ($2.00/hr.	$45.80	$27.00
Total (labor and overhead)	$91.60	$54.00
Total production costs (not including downtime)	$98.18	$67.83
Per unit cost	$ .394	$ .272
Savings per piece	$ .122 or 31%	

Hundreds of laboratory and actual production tests have already proved that Demon high-speed steel bands race through ordinary materials and walk through the toughest ones. Listed below are typical tough materials on which these high-speed steel blades excel by far.

Carbon Steels.....#1010 to #1095
Manganese Steels.....#1320 to #1340
Nickel Steels.....#2315 to #2515
Molybdenum Steels.....#4023 to #4820
Chromium Steels.....#5120 to #5210
Chromium-Vanadium Steels..#6130 to #6150
Ampco Bronze.....All Grades
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Models:	102	203	304	405	506
Capacity:	1" to 2"	2" to 3"	3" to 4"	4" to 5"	5" to 6"

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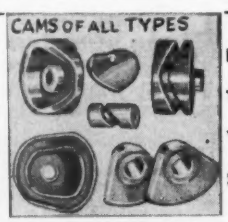

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EISLER ENGINEERING CO., INC.
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CONTROL "By Hand" Di-Profiler* TRADEMARK

The Di-Profiler is a new multiple action tool that (1) Reciprocates (2) Oscillates and (3) Rotates when used with the spindle attachment. Stroke is adjustable from 0" to 1/4".

The Di-Profiler uses regular needle files on soft steel, diamond files on hardened steel and carbides and a variety of other attachments for fine hand or machine work.
Makes difficult work easy. Hundreds of applications. Write for illustrated literature and prices, today. *Reg. U. S. Pat. Off.

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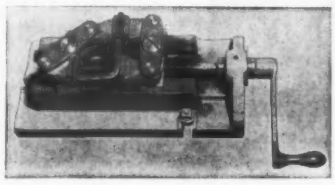

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Tools tapped on
LASSY TAPPERS
present no problem at assembly
Made in 3 sizes to fit your need
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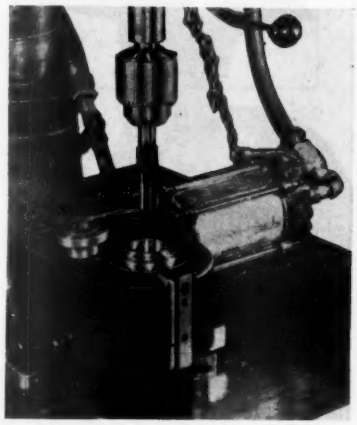
AIR OPERATED COLLET CHUCK

A completely new-type air-operated collet chuck, actuated by means of a heavy-duty air cylinder through a gear train, has been announced by Lynair, Inc., Jackson, Mich.

By means of a lock-ring in the bottom of the fixture (an exclusive feature) the collet is held stationary in position at all times.



The collet is opened and closed by means of a separate sleeve on its outside. When closed on the workpiece, it will not release even though air pressure failure may occur, thus permitting the machining to be completed.

Another advantage is that the positive holding of the lightest plastic to the heaviest steel or cast iron part is done without damage to the outside surface, such as external threads, knurls, etc.

Capacity of the collet ranges from 1/16" through 3-3/4". Stock diameter up to 1-3/8" can be passed through the collet.

Lynair will gladly furnish additional information to those requesting it. **Circle No. D1.**

THIS IS IT!

Is your name on the back cover of this magazine?

If not, you may miss the rest of our **Air Power for Metalworking** series that started on Page 54. This series will continue through the next 5 issues and will cover the installations, maintenance and application of air systems. You won't want to miss a single one of these or many other "know-how" articles soon to be published.

For further information on how you can receive **TOOLING and PRODUCTION** Magazine regularly, send us your name, title, company and company address on the Inform-A-Gram Card that is bound into this copy and Circle No. 1975.

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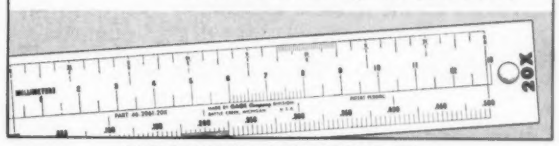

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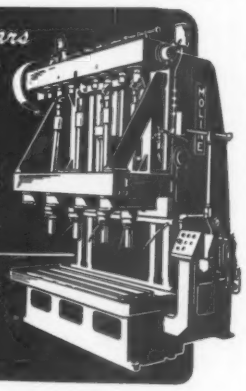
MACHINE TOOLS
Have Cut Production Costs for American Industry



MOLINE TOOL CO.
HOLE-HOG
MOLINE, ILLINOIS

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CIRCLE INFORM-A-GRAM KEY NO. 1452

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by BOYAR-SCHULTZ

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It is particularly useful in accurately grinding to scribed lines for templates and form tools.

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A bench size Tool for smaller profile and contour grinding. A fast operating machine tool which quickly performs much work formerly requiring hours of hand time. Spindle speed, 20,000 R. P. M. Accommodates wheels ⅛" to 1" diameter.

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2 BANDSAWS in 1

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USE IT FOR HORIZONTAL CUT-OFF

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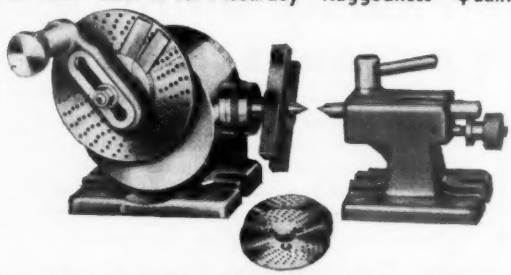

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NEW SPINDLE LINE SPEEDS SPECIAL MACHINE BUILDING

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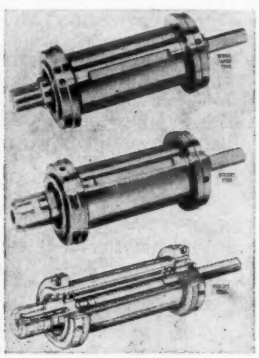

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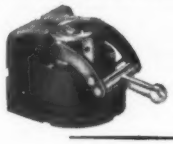

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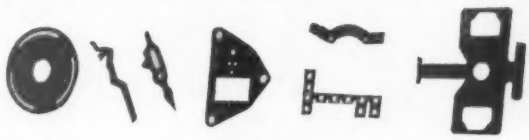

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The drill spindles are held rigidly in position when two nuts are tightened. Sturdily constructed. Suitable for adaptation to large or small drill presses. Models A and B made with sleeve. Models C and D with overarm adaptation, equipped with guide pins, springs and brackets, mounted to a cast-iron base with surfaces ground for use of drill fixtures. All models can be used for drilling or tapping on tapping machine or drill press with reversible spindle. Also used with standard tapping heads.

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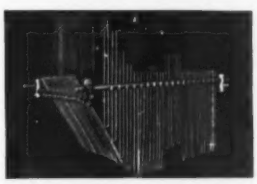

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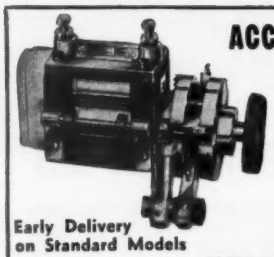

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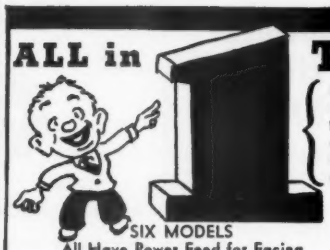

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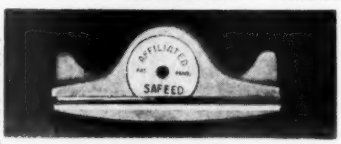

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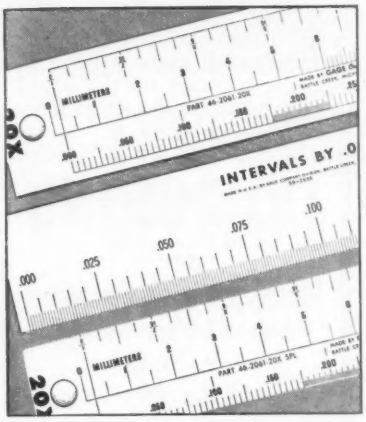
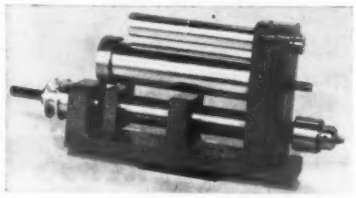
Comparator Scales



Comparator scales at all standard magnifications have been designed in a number of styles by the Gage Co., Battle Creek, Mich. They are of non-breakable plastic, accurate, and produced by a "Deep-Etch" process. These scales are particularly helpful in making quick, accurate measurements on optical projectors without moving work. They are most desirable for use on the drafting table and in constructing comparator chart layouts. Write for Bulletin No. 54-1511, or—**Inform-A-Gram Key No. D2.**

High Speed Drilling Head

Designed for maximum simplicity, this precision high speed drilling head is being introduced to industry by the Telematic Corp., 3338 S. Robertson Blvd., Los Angeles 34, Calif. This air feed unit with Hydro-Check control has been designed as a low



cost, highly flexible drill head. It is only 12½" in overall length and 2" wide, with a full 2" stroke and fast return. It is ideal for multiple spindle drilling operations. Sides and bottom of the drill head body are machined square and parallel to spindle to simplify alignment of drill in setups. The drill also is available mounted on a T base with automatic air control box and an electrical cycle timer. **Key No. D3.**

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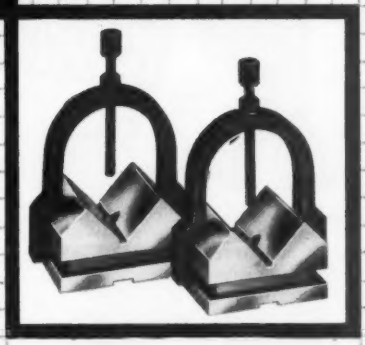
MODEL 1250 (1¼ x 1¼ x 1⅜")



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CIRCLE INFORM-A-GRAM KEY NO. 1494

DIAMOND TOOL FIRM CHANGES NAME

The company name of H. W. Twogood, Los Angeles, California, has been changed to Wheel Trueing Company of California, it was recently announced by Harry W. Twogood, president.

Mr. Twogood is both a pioneer and a veteran of the industrial diamond industry, having entered the industry more than 40 years ago, when, in collaboration with Harvey B. Wallace (Founder and President of Wheel Trueing Tool Company of Detroit and its subsidiaries) he set up one of the country's first factories for the manufacture of diamond tools.

Twogood established the California operation more than 30 years ago when he settled in Los Angeles and started supplying the West Coast with diamond tools of his own manufacture and also with those made by Wheel Trueing Tool Company of Detroit. His company built up a wide following throughout the Pacific States, and Twogood later built a modern factory and installed the newest equipment and practices for diamond tool manufacture and for the equally important business of resetting worn diamond tools.

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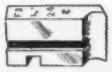

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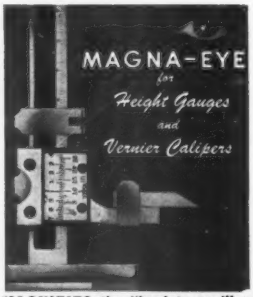

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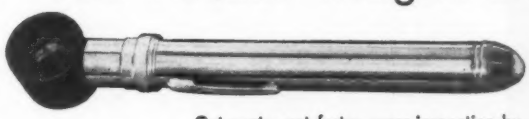

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